MAY, 1957

Commercial Fertilizer

and PLANT FOOD INDUSTRY

Take a good look at your multiwall bag!

Like women's bathing suits, multiwall bags also reveal the passing of time.

Is your bag a vivid, modern example of your business vitality . . . or is it dull, drab and lacking in appeal?

Is your bag the ideal package for your product, in size and construction, or is it a carry-over from the past?

To compete successfully in your markets, your package should be as up-to-date as this issue of the magazine . . . *if it isn't*, it's a good idea to send for us.

KRAFT BAG CORPORATION

Gilman Paper Company Subsidiary

630 Fifth Avenue, New York 20, N. Y.
Daily News Bldg., Chicago 6, Ill.

Plants at St. Marys, Georgia and Gilman, Vermont

Sales Agents for The Kraftpacker

Gilman PAPER CO.
- St. Marys Kraft Corp.
- Gaylord Container Div.
- The Fitzgerald Corp.
- Kraft Bag Corp.

Dependable as a service for 2 generations

The Newest
KRAFTPACKER
with variable proportion any free-flowing material—faster—and with more accuracy, than any open mouth bag filling machine of its type in use today—regardless of price!

☐ We are interested in improving our bag.

☐ We are interested in your Kraftpacker.

NAME OF COMPANY_____

ADDRESS_____

CITY_____ ZONE____ STATE_____ PRINCIPAL_____

PRODUCT MFD._____ CP

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and PLANT FOOD INDUSTRY

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Commenting Freely

by Bruce Moran

Increasing consumption should soon begin to catch up with the surplus which has hung over agriculture for nearly 15 years, and the USDA economists think another 5 years or so will get things back to normal. Farm income is definitely rising. 1955 total was $11,300,000,000 and 1956 is estimated at 11,700,000,000—a four million dollar rise, which is expected to continue this year.

Perhaps this development will make needless the "broadscale" re-examination of Government farm programs demanded by the Master of the National Grange.

Certainly the farmer is producing more with the same total resources—about 36% more than in 1940. Machines can be credited with a great deal of this progress. Mechanization in the past 16 years has increased physical efficiency about a third. And research has been translated into action on the farm during the very prosperous years.

While things are not too good just now, they look mighty good for the immediate future.

"International's water-route pioneering has trimmed our costs!"

Pushing barge shipments of Triple Super up the Mississippi has meant immediate savings at our inland plants, says Ralph Fraser of the Summers Fertilizer Company

"Our plant men are always glad to see International's Triple come in," says Ass't Plant Superintendent Frank Prenger.

Mixed goods manufactured in the Summers' plants are sold in 15 northern states under the well-known brand name, "Best-On-Earth".

International's natural-curing for a minimum of 5 weeks contributes to excellent physical condition that holds down handling problems.

Prenger checks a new shipment of International Triple. Uniform particle size . . . desirable moisture content mean good ammoniation.

"From the Dakotas to Maine, our 9 fertilizer plants meet a lot of different conditions." says Ralph Fraser, vice-president of the Summers Fertilizer Company.

"But one thing sure — in every plant where we use triple super, International's water-routing saves us money."

"That's one of the reasons we welcomed their barge shipments up the Mississippi River. It meant immediate savings at our plants in Grand Forks, N. Dak., and Sioux Falls, S. Dak.," adds Fraser.

"Our East Coast plants, too, rely on International's dependable service, speedy delivery and low shipping costs."

What's more, experience has proved International's Triple arrives in good condition, whether it is shipped by barge or by rail. "The men in the plant like to handle International's Triple," says Frank Prenger, assistant superintendent of the Baltimore plant. "We think it has the proper moisture content . . . the desirable physical condition that gives us good ammoniation results."

The Summers Fertilizer Company dates back to 1922 when the Baltimore plant was established. Now the organization includes 9 fertilizer plants and 3 related plants serving a 15-state area.

International's barge shipments, combined with "on-site" warehousing, can help you realize big savings, too. If you are not already an International user, put us to the test. Write or wire for full information on prices, shipping and warehousing arrangements.

INTERNATIONAL MINERALS & CHEMICAL CORPORATION

PHOSPHATE CHEMICALS DIVISION . . . . . 20 N. WACKER DRIVE, CHICAGO 6

JUST AROUND THE CORNER *by Vernon Mount*

COMPETITION between Federal agencies and industry for the services of technically trained men stresses again the need for more of them. The Government and Industry should join hands to recruit more youngsters into these courses.

FEDERAL agencies are being permitted to offer all sorts of benefits, which industry cannot chalk up as legitimate expense, and you will begin to hear of bills in Congress aimed at making Defense Department jobs more popular. The Government calls it "raiding" when private enterprise lures away a technologist.

THERE is much to be said on both sides of this matter, but the heart of it is the fact that Russia is turning out technicians fast, and we are losing ground in the race for brain-power. So there should be less conflict and more collaboration in this field, and much, much more done to make the youngster realize the vital need for technical training.

Yours faithfully,

Vernon Mount

"We see Burlap from both sides of the fence,"

says Cy Yarborough Jr., manager of the Hastings Potato Growers Association, Florida. "As *customers*, our members order their fertilizer in burlap bags because they're easy to handle in the field, they don't break, and they have *resale* value. As *sellers*, we ship potatoes in burlap bags because we know they'll arrive at their destination in good condition. Burlap is made to take scuffling and abuse and it provides good circulation. Our customers ask *us* to ship in burlap."

On your side of the fence isn't burlap easier to handle? Doesn't your fertilizer packed in burlap have more sales appeal?

Just ask your own customers—

they'll tell you that burlap

Is strong — takes dragging, dropping, *man-handling* — any tough job on the farm.

Gives good ventilation — keeps farm supplies and products fresh.

Laughs at sudden showers — wetness or dampness can't weaken it.

Saves money — extra value from re-sale and re-use.

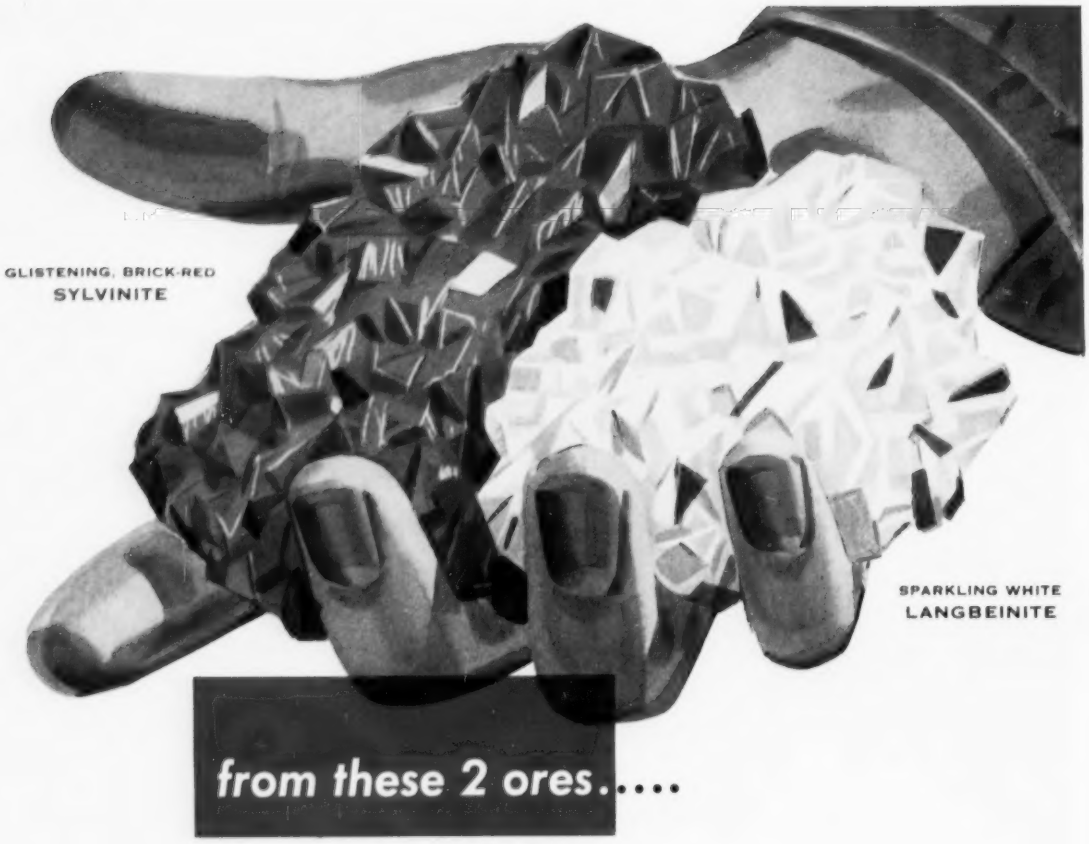
Saves storage space — stacks to any height without slipping.

Has 1000 uses — always in demand on the farm (popular with farm wives, too!)

THE BURLAP COUNCIL

of the Indian Jute Mills Association

155 East 44th Street, New York 17, N. Y.



4 potash products for all your potash needs

From SYLVINITE . . . standard and granular muriate of potash.

From LANGBEINITE . . . SUL-PO-MAG® (double sulphate of potash-magnesia).

From BOTH ORES . . . sulphate of potash.

These two basic potassium ores can supply *your complete potash needs* for mixed fertilizers. After mining and refining, they are available in these four forms:

1. Standard 60% K_2O Muriate of Potash for mixed fertilizers.
2. Granular 60% K_2O Muriate of Potash for mixed fertilizers and direct application.
3. 50 to 52% K_2O Sulphate of Potash for *premium* mixed fertilizers.
4. SUL-PO-MAG (22% K_2O–18% MgO)—premium potash and water-soluble magnesium for *premium* mixed fertilizers.

You can get *all four* of these products, for all your potash needs, from *one source* of supply. Other advantages: uniform quality in every pound; time-saving convenience in ordering and scheduling, and personalized sales and service from experienced people at your nearest district sales office:

ATLANTA, GA.— 1325 Fulton National Bank Bldg., M. S. Malone. *District Sales Manager.*

CHICAGO, ILL.— 20 North Wacker Drive, C. E. Martin, *District Sales Manager.*

NEW YORK, N. Y.— 485 Lexington Ave., W. W. Chadwick, *District Sales Manager.*

SHREVEPORT, LA.—418 Market St., J. K. Lindsey, *District Sales Manager.*

POTASH DIVISION PRODUCTS: For Agriculture—Sulphate of Potash, Muriate of Potash, Sul-Po-Mag®, Stock Salt. For Industry—Potassium Chloride, Sulphate of Potash, Muriate of Potash, Muriatic Acid, Caustic Potash, Carbonate of Potash, Liquid Chlorine, Magnesium Oxide. Mines at Carlsbad, New Mexico. Plants at Carlsbad, New Mexico, and Niagara Falls, New York.

International Minerals & Chemicals

potash division **INTERNATIONAL MINERALS & CHEMICAL CORPORATION**

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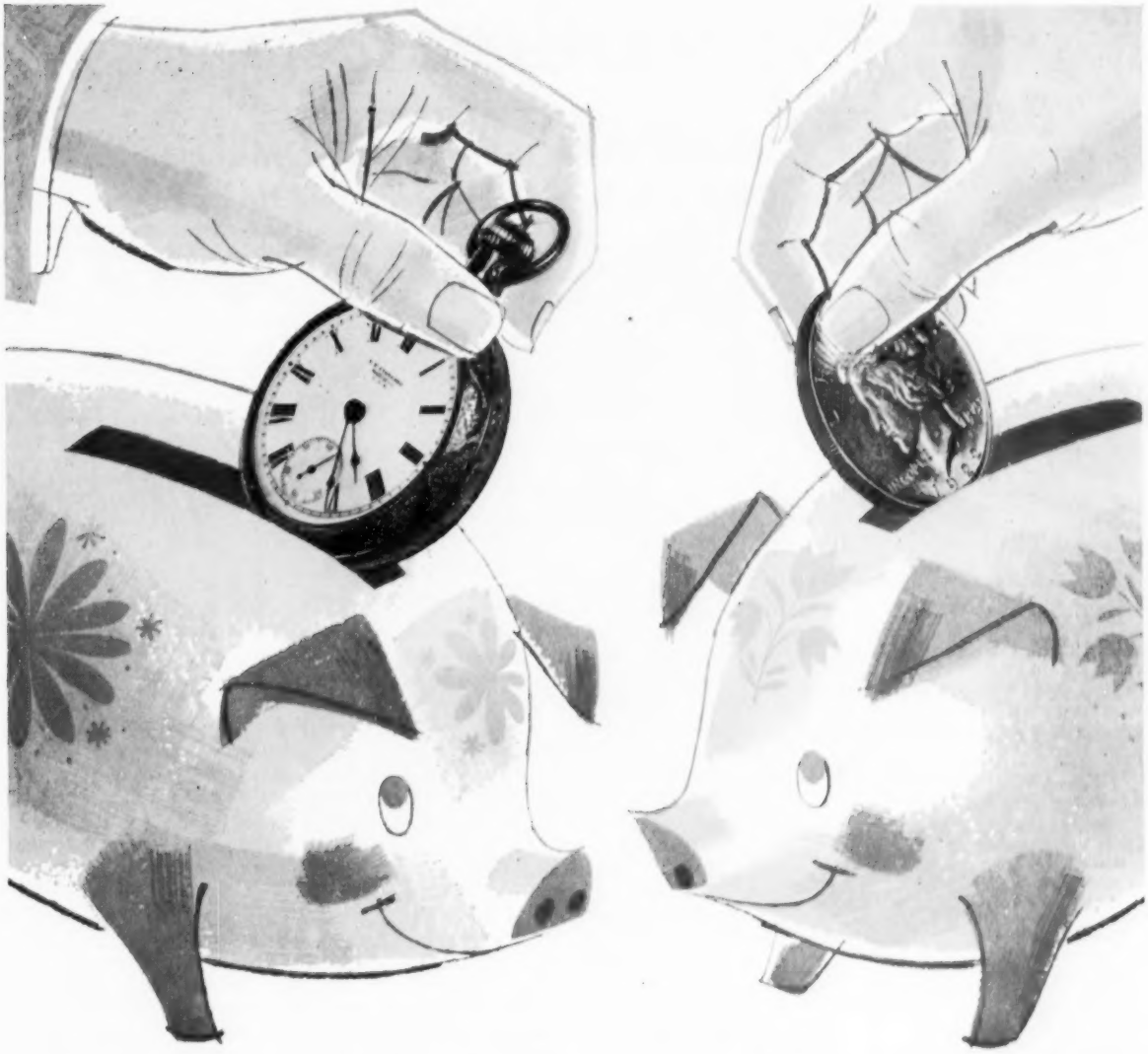

TIME IS MONEY... SAVE BOTH!

ORDER NITROGEN PRODUCTS FROM SINCLAIR NOW

There are two big reasons why you should sign now with Sinclair for your supplies of nitrogen solutions, anhydrous ammonia and aqua ammonia.

First – the completion and opening of a centrally-situated new plant in Hammond, Indiana, means substantial savings in delivery time and shipping costs for most Mid-West nitrogen users.

Second – your seasonal supply problem can be solved by this plant's vast storage capacity . . . products will be delivered when you need them to meet your production schedule.

Let Sinclair help you solve your nitrogen supply problems and save you time and money in the bargain. Phone or write . . .

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Associations

NPFI OPPOSES AMENDMENT KILLING RIGHT TO COMPETE

John D. Conner, general counsel for National Plant Food Institute, testifying March 27 before the Antitrust and Monopoly Subcommittee of the Senate Committee on the Judiciary in opposition to the enactment of S. 11, said that "there are no practices presently used in the distribution of fertilizer which warrant the passage of the proposed legislation," and emphasized that there is no justification for this Congress to now deprive a seller of the "vital right to meet competition or to so severely restrict it that it loses its significance."

Mr. Conner said that S. 11, a bill to amend the Robinson-Patman Act, in effect, would severely restrict the right of a manufacturer to meet an equally low price of a competitor.

"The proposed legislation would jeopardize some of the present marketing practices upon which the sale of fertilizer and fertilizer materials are dependent," he said.

"There has never been a proceeding in the fertilizer industry based upon a violation of the Robinson-Patman Act, in so far as we have been able to determine. We know of no facts to support an inference that there are at present predatory competitive practices which are being masked by the 'right to meet competition' proviso. To the contrary, we believe this right to meet competition gives to the fertilizer manufacturer the right to compete for the market in the largest geographical area within which he can market and make a profit.

"On the other hand, there are sound reasons for feeling that the farmer has been the beneficiary of the present vigorous competition under which fertilizer is sold. The price of fertilizer has advanced less than that of any other commodity bought by the farmer. Fertilizer prices are now only 150 per cent of what they were during the 1909-14 base period as compared with 290 per cent of the base period for other commodities purchased by farmers."

Mr. Conner testified further that: "This right to meet competition is an integral part of the marketing of fertilizers. It is essential that it remain a part of this system, particularly because of the changing conditions resulting from the soil bank program. There is no evidence of its misuse in the fertilizer industry. If it should be, there are believed to be adequate means under the present Robinson-Patman Act to correct any such misuse. On the other hand, there are sound reasons for feeling that the proposed legislation would jeopardize some of the present practices which are a vital part of our distribution system."

AN OPEN LETTER TO SELLERS OF NITROGENOUS ORGANICS

March 29, 1957.

Gentlemen:

For many years the State fertilizer law has required showing the guarantee of NITROGEN on the fertilizer tag or bag, not only in Florida, but in other States. Yet, producers of fertilizer materials, as well as brokers and importers, continue to offer for sale, or sell certain materials on the basis of $—— per unit of AMMONIA.

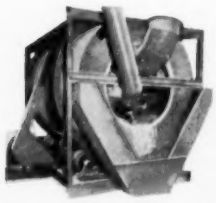
Formulae are figured on the basis of NITROGEN, retail sales are made on the basis of NITROGEN, and the use of the term AMMONIA now has no basis for use in our industry in the sale of fertilizer or materials. Our membership, consisting of over 20 fertilizer manufacturers, and representing a considerable portion of the tonnage of fertilizer manufactured in Florida, respectfully request that fertilizer materials, when not sold on a per ton basis, be offered or sold on the basis of $—— per unit of NITROGEN, and that the term AMMONIA be discarded. Your assistance in making this needed change would be appreciated.

Very truly yours,

INLAND FERTILIZER COUNCIL

Geo. M. Barley **Secy.-Treas.**

NEW STAR* OF THE SACKETT GRANULATING TEAM



SACKETT AMMONIATOR
A performance-proved machine combining the desirable T.V.A. submerged ammoniation design with Sackett time-honored rugged construction. Select the size you need from 15 to 60 tons per hour.

SACKETT STAR* GRANULATOR
This new machine has been called "The Missing Link" so badly needed in granulation. It performs the important job of forming a far greater portion of the initial feed into pellets of acceptable size. Select yours from a complete capacity range from 15 to 60 tons per hour.

The Sackett STAR* Granulator is an entirely new and revolutionary approach to the granulation of fertilizer mixed goods.

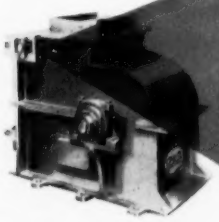
Here's what the STAR will give you:

CONTROLLED GRAIN SIZE
New concept of grain size control. Larger percentage thru 6 on 16 mesh range, smaller portions of under and oversize.

HIGHER PRODUCT RECOVERY
Up to fifty percent increase in product recovery, because of its inherent, vigorous rolling—*not sliding*—action.

HIGHER PRODUCTION CAPACITY
More granulation the first time through, means substantially higher production capacity.

LOWER DRYING COST
Higher percentage of on-size in initial granulation means less fuel cost per ton due to lower hydration of total feed.



SACKETT BAR MILLS
This is the first mill, to our knowledge, that has been designed specially for use in *cracking* . . . not pulverizing . . . the granular oversize from the final product classifying screen. Its gentle impact action on the material accomplishes desired size reduction with minimum formation of fines.

Established Fertilizer producers are invited to get our up-to-the-minute counsel on their conversion and expansion programs. It is available without cost.

OTHER SACKETT PRODUCTS

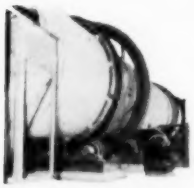
Batch Weigh Systems

Mixing and Shipping Units

Materials Handling Equipment

Superphosphate Manufacturing Processes

*U. S. and Foreign Patents Pending



SACKETT COOLERS
No other manufacturer offers such a complete selection of sizes and capacities. Rugged construction and highly efficient dust control are two of their noteworthy features. Infinite number of diameter and length combinations assure you of just the right one for your capacity and space requirements.

SACKET DRYERS
These highly efficient direct heat gas or oil-fired units are built to give many years of service in spite of the severe conditions under which they must operate. Unique tuyere design combustion chamber assures reduced chemical losses and maintenance costs. Built in sizes to meet every capacity requirement.

THE A. J. SACKETT AND SONS COMPANY
SACKETT EQUIPMENT
BALTIMORE · MARYLAND

Architects and Manufacturing Engineers to the Fertilizer Industry Since 1897.

America's Foremost Creative designers & Builders of Commercial Fertilizer and Superphosphate Plants . . . Related Production Equipment

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Houston, Texas

Arcadian® News

Volume 2 | For Manufacturers of Mixed Fertilizers | Number 5

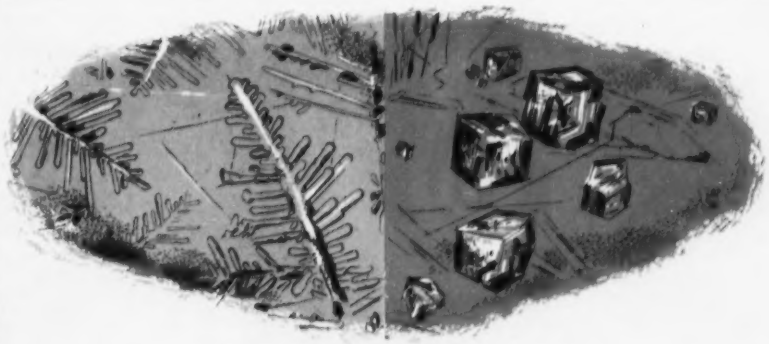
HERE'S HOW URANA® HELPS TO PREVENT FERTILIZER CAKING

REACTS IN MIXTURE TO FORM CUBE-LIKE CRYSTALS

In the manufacture of mixed fertilizers, ammonium salts react with potassium chloride to form ammonium chloride crystals. If fertilizer has a tendency to cake at the factory or in the bag, it's often because these microscopic crystals are fern-like or needle-shaped and bind together in the mixture.

More and more fertilizer manufacturers are avoiding this cause of caking, by using URANA Nitrogen Solutions in the ammoniation process. The chemical reaction of these Solutions produces ammonium chloride crystals that are cube-shaped with much less tendency to bind together in the mixture.

When you use URANA Nitrogen Solutions, you get softer set in storage piles, easier, faster handling from bulk to bagging and far less secondary caking in the bag. The result is a better quality, better conditioned fertilizer, and often a reduction in costs.



Micrograph of ammonium chloride crystals.

Five different URANA Nitrogen Solutions are available to fit every ammoniation situation, including the manufacture of high-analysis mixed goods. These Solutions range from 41% to 49% nitrogen in various combinations of ammonia, ammonium nitrate, and urea.

The cost per unit of urea nitrogen in URANA Nitrogen Solutions is exceptionally low. And, by getting three forms of nitrogen in one easy-handling solution, you give your fertilizer extra plant food value without additional handling and shipping.

Start now to get all the facts on the many advantages of URANA Nitrogen Solutions. Contact Nitrogen Division, Allied Chemical & Dye Corporation, 40 Rector Street, New York 6, N. Y. Phone: Hanover 2-7300.

Arcadian News for Fertilizer Manufacturers . . . . . from NITROGEN DIVISION

New Methods of Timing Fertilizer Increase Protein Content of Hay

Grassland fertilization has always been an attractive sales opportunity to the fertilizer manufacturer, however it has been difficult to get farmers to use heavy applications of fertilizers on grass hay and pastures. Recent developments in new methods of fertilizing grass now promise to open up this big market.

These methods, which call for the proper timing of heavy applications of fertilizer in the fall and spring, have resulted in big yields of forage containing 16% to 20% crude protein as well as a high content of total digestible nutrients.

Four Tons of 20% Protein Hay

Heavy application of high-nitrogen fertilizer in the late fall quickly moves plant foods into the roots for use the following spring. Heavy application of nitrogen top-dressing in the late spring, a few weeks before harvest, greatly increases the protein content of the grass. Up to 70% of the nitrogen top-dressing moves directly into the protein of the first cutting of hay. Farmers using these new methods have produced as much as 4.4 tons of grass hay per acre with up to 20% crude protein content.

The high value of this extremely high quality forage makes heavy fertilization highly profitable. Ordinary grass hay yields 1½ tons per acre averaging about 8% crude protein or 240 pounds of protein equivalent per acre. When proper fertilization increases the yield to 4 tons of 20% protein hay per acre, or 1,600 pounds of protein equivalent, the farmer gets an extra 1,360 pounds of crude protein from the fertilizer.

The value of this extra protein will pay for a lot of fertilizer. The mixed fertilizer and the nitrogen top-dressing together should supply at least 200 pounds of actual nitrogen per acre with phosphorus and potash to balance. Grass ordinarily needs little potash, but the high-yield, high-protein program calls for plenty of potash to keep stalks stiff to prevent lodging.

Importance of Nitrogen Timing

To get these big yields, it is important to apply a heavy nitrogen top-dressing just as the grass seedheads start to shoot out of the sheaves a few weeks before the first cutting. A cyclone seeder, or even airplane application, does this job well. This nitrogen top-dressing works better if plenty of complete fertilizer has been applied the previous fall to pack the roots full of plant food for early and continued spring growth.

Most of the late spring nitrogen top-dressing goes directly into the crop instead of being tied up by soil microbes. It shoots the protein content of the grass up very high. When the hay is cut at the proper early stage for good palatability, the fiber stays low and the protein stays high, and the total yield is also high.

Making Hay Really Pay!

One reason that fertilizing grasslands has been disappointing is the lack of a quick, easy analysis of the feed value of forage. Another reason is the fact that not enough high-nitrogen fertilizer has been used.

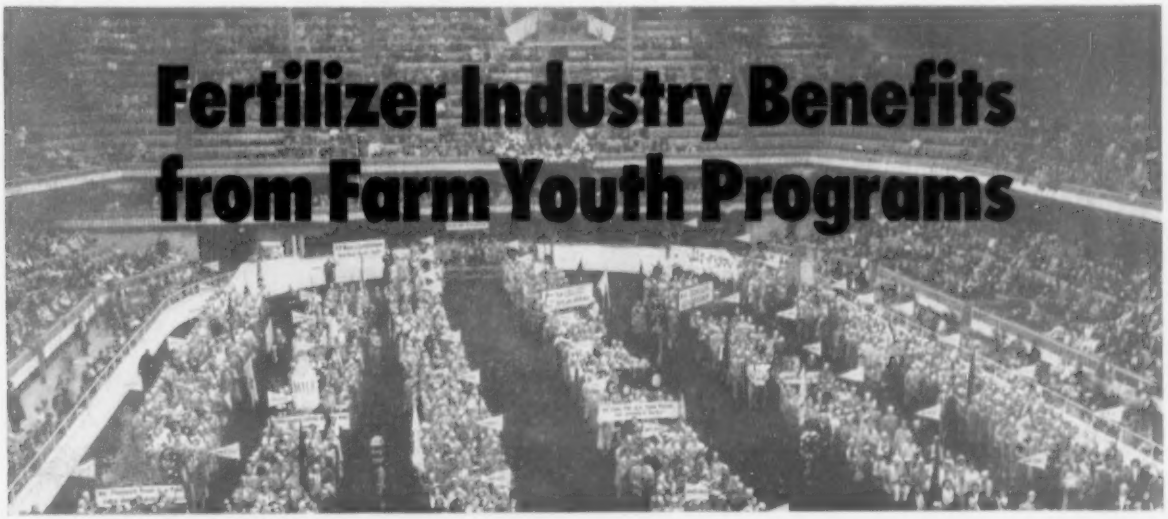
For example, when hay gets 100 to 150 pounds of nitrogen per acre, it will produce a higher yield but the protein content may remain low. When 200 pounds of nitrogen per acre is used, the protein content of the hay jumps up, double or more. That's what makes hay really pay!

Farmers producing high-protein hay will usually feed it to their own livestock. If they sell it, a price based on crude protein content makes good sense. One farmer, using a base price of $25 per ton for 8% protein hay, adds $1 per ton for each extra 1% of protein above 8%. Thus a 20% protein equivalent hay would sell for $37 per ton.

You can extend your sales season by using these new facts to sell more fertilizers for grasslands in the late fall and more nitrogen top-dressing for grasslands in the late spring.

Arcadian News for Fertilizer Manufacturers . . . . . from NITROGEN DIVISION

Fertilizer Industry Benefits from Farm Youth Programs



IN ADDITION TO ITS EXTENSIVE ACTIVITIES TO EDUCATE FARMERS ON FERTILIZERS NITROGEN DIVISION COOPERATES WITH 4-H CLUB AND F.F.A. FARM YOUTH PROGRAMS

If every farm were operated on an efficient, business-like basis, the use of fertilizer would be many times what it is today. An informed, progressive farmer would no more think of farming without fertilizers than he would of farming without tractors. The more really good farmers there are, the more fertilizer will be used.

Nitrogen Division, realizing this, actively supports efforts to raise the general standards of American farming. Farmers themselves, as well as the fertilizer industry, stand to gain much from such a program.

One of the ways in which Nitrogen Division contributes to agricultural improvement is its cooperation with the 4-H Club and the Future Farmers of America. These young farmers are eager to adopt modern practices to constantly improve their farming skills.

4-H Club Field Crops Program

Nitrogen Division is the donor to the 4-H Field Crops Program, which last year had an enrollment of about 300,000 young farmers. As donor, Nitrogen Division provides six $400 scholarships to the national winners, all-expense trips to the 4-H Congress to the state and national winners, and a maximum of four gold medals to the winners in each county. In addition, Nitrogen Division helps finance efforts to enroll more members in Field Crops, and has published an attractive Field Crops Manual for use by local club leaders. Nitrogen Division field men call on state 4-H Club offices to offer their assistance in furthering the Field Crops Program.

All of Nitrogen Division's work with 4-H is done in cooperation with the National Committee on Boys and Girls Club Work. This organization, located in Chicago, serves as a liaison agency between donors and the Federal and State Extension Service, which operates the 4-H program.

Participants in the Field Crops Program learn to look on farming as a business. They keep detailed records of expenditures and cultural practices; they run comparison tests; they work always to "make the best better." And when they take over the family farm or go out on their own, you can be sure they will be better farmers for having been enrolled in the 4-H Field Crops Program.

Future Farmers of America

Nitrogen Division also contributes to the Future Farmers of America Foundation. The FFA, a club for boys enrolled in a high school vocational agriculture program, is directed by the Department of Health, Education and Welfare. Many FFA boys already carry on their own independent farming operations.

Fertilizer dealers and manufacturers can help farm youth programs in several ways. Perhaps you have a room that can be used as a club meeting place. You could provide local awards, give educational talks, or sponsor dinners. Probably most welcome of all would be a tour of your plant, or you may have fertilizer field demonstrations which will interest farm youngsters.

Why not talk to your county agent about how you can help with the 4-H Field Crops Program. Or see your high school vo-ag teacher about lending a hand with the work of the Future Farmers.

NITROGEN *plus* SERVICE

There are many reasons why it pays you to deal with Nitrogen Division, Allied Chemical. You are served by America's leading producer of the most complete line of nitrogen products. You benefit from millions of tons of nitrogen experience and the enterprising research that originated and developed nitrogen solutions for the fertilizer industry. You are assured of dependable supplies from three huge plants at Hopewell, Ironton, and Omaha. Your nitrogen is delivered to you by the best transportation facilities and equipment. You get technical assistance and formulation advice from the largest and most efficient staff of nitrogen experts. Your sales are supported by the most powerful advertising campaign ever conducted to sell fertilizers. Nitrogen Division is your headquarters for NITROGEN *plus* SERVICE. Look over the big line and contact one of the 14 offices listed below.

Arcadian® Nitrogen Solutions

	CHEMICAL COMPOSITION %					PHYSICAL PROPERTIES		
	Total Nitrogen	Anhydrous Ammonia	Ammonium Nitrate	Urea	Water	Approx. Sp. Grav. at 60°F	Approx. Vap. Press. at 104°F per Sq. In. Gauge	Approx. Temp. at Which Salt Begins to Crystallize °F
NITRANA®								
2	41.0	22.2	65.0	—	12.8	1.137	10	21
2M	44.0	23.8	69.8	—	6.4	1.147	18	26
3	41.0	26.3	55.5	—	18.2	1.079	17	-25
3M	44.0	28.0	60.0	—	12.0	1.083	25	-36
3MC	47.0	29.7	64.5	—	5.8	1.089	34	-30
4	37.0	16.6	66.8	—	16.6	1.188	1	56
4M	41.0	19.0	72.5	—	8.5	1.194	7	61
6	49.0	34.0	60.0	—	6.0	1.052	48	-52
7	45.0	25.3	69.2	—	5.5	1.134	22	1
URANA®								
10	44.4	24.5	56.0	10.0	9.5	1.108	22	-15
11	41.0	19.0	58.0	11.0	12.0	1.162	10	7
12	44.4	26.0	50.0	12.0	12.0	1.081	25	- 7
13	49.0	33.0	45.1	13.0	8.9	1.033	51	-17
15	44.0	28.0	40.0	15.0	17.0	1.052	29	1
U-A-S®								
A	45.4	36.8	—	32.5	30.7	0.925	57	16
B	45.3	30.6	—	43.1	26.3	0.972	48	46
Anhydrous Ammonia	82.2	99.9	—	—	—	0.618	211	—

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NPFI Will Study Factors Influencing Fertilizer Buying

A national survey to "determine the factors which influence the farmer to buy fertilizers" soon will be undertaken by National Plant Food Institute, as a preliminary step in expanding the fertilizer market.

The survey was recently authorized by the Institute's board of directors.

"Information obtained in the survey more clearly will point the direction that should be followed to achieve an expansion of the fertilizer market," said Dr. Russell Coleman, executive vice president of the Institute.

"The fertilizer industry has a productive capacity of 25 to 50 per cent more plant food than it is now selling. Yet agricultural leaders say that fertilizer usage should be at least twice the present consumption. The need for an accelerated promotional program, conducted in harmony with the recommendations of the land-grant colleges and other recognized agricultural agencies, is apparent."

Dr. Coleman said that "plans for a forward looking program to achieve greater fertilizer acceptance and usage now are in the preliminary stages," and added that "shortly, a detailed promotional program will be presented to Institute members for their consideration."

School Date Changed From May 3-4 to 17-18

Dates of the two day school for chemical analysts at Purdue University, sponsored by NPFI, and announced here last month, have been changed from May 3-4 to May 17-18.

East Canada Meet Slated for July 10-14

The 12th annual convention of the Plant Food Producers of Eastern Canada has been scheduled for July 10-14 inclusive at the fabulous Manor Richelieu, Murray Bay, Quebec. There will be a cruise ship, as in the past, from Montreal and reservations for this should be made direct with District Passenger Agent Fred L. Gawley, Canada Steamship Lines, Toronto, Ont.

Hotel reservation blanks should be secured from C. W. Jarvis, Canadian Industries Ltd., 3434 Dundras St., Toronto 9, Ont. Hotel rates are American plan, $22 per day for men, $10 for ladies. Sitting rooms $16. Write for registration form.

NEW DEVELOPMENTS IN—

FERTILIZER TECHNOLOGY

(A SURVEY)

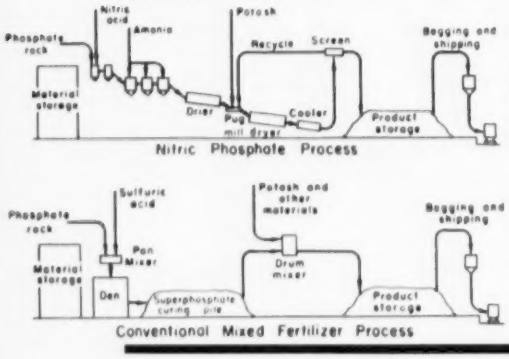
by *D. R.* Boylan
Iowa State College
Ames, Iowa

The rapid growth of the fertilizer industry in recent years has been due to two main factors. First, the general increase in the use of fertilizer materials which has resulted from an expanding knowledge on the part of the farmer and second, the development of new processes and technology in the fertilizer industry. Products of the latter development have been new sources of raw materials, particularly nitrogen and phosphorus compounds; new processes for the conversion of raw materials into useable fertilizer products; new products having special characteristics with respect to physical and chemical properties; and new problems relative to agronomic aspects and trace element dificiencies.

An excellent review of the technology and advances in the fertilizer industry up through 1950 was given in a short course in "Fertilizer Techology" at the University of Maryland, College Park, August 21-25, 1950. This was sponsored by the Fertilizer Committee of the Soil Science Society of America and was an outgrowth of discussions among soil scientists, agronomists, and fertilizer technicians in the industry and in the State and Federal services. It was evident from this study that research by chemists and engineers played an important part in the technological advances made in the expanding fertilizer industry. That this has been a characteristic of the present fertilizer industry is shown by the continuing technological advances being made. It is the purpose of this paper to present a review of the significant new developments which have occurred in the last six years.

This paper was presented at the recent Midwest regional meeting of the American Chemical Society at Ames, Iowa.

Figure 1. Nitro phosphate and conventional mixed fertilizer processes (21).



Acidulation Processes

Significant developments have been made in recent years in the acidulation of phosphate rock to produce new and improved phosphatic materials suitable for fertilizers. One such development is the nitric acid acidulation of phosphate rock. Nitric acidulation has been used commercially in Europe for about 20 years in Norway, Holland, Germany, and France, (13, 7, 17, 20). Tennessee Valley Authority reviewed these processes and proposed four basic processes for technical development in the United States. (14, 21). The four processes are similar and are represented by a single flow diagram in Figure 1. **(21)** Also shown in Figure 1 is the flow diagram for a conventional superphosphate process.

The nitric processes differ principally in the materials added in each case to prevent the formation of calcium nitrate. Basic reactions for the four processes are given in Table 1. Each process consists of mixing phosphate rock with nitric acid, or with a mixture of nitric acid and sulfuric acid, in agitated vessels and ammoniating the slurry in other agitated vessels with gaseous anhydrous ammonia. Ammonium nitrate and dicalcium phosphate are formed in the ammoniation step and the water content is kept sufficiently high to maintain a fluid slurry. In each process the slurries are dried and appropriate potash salts are added to the product to produce a complete fertilizer.

Dicalcium phosphate is a result of ammoniation as shown in Table 1 and since this contains less calcium than the phosphate rock the appearance of hygroscopic calcium nitrate in the product must be prevented. In process I, phosphoric acid is added to form additional dicalcium phosphate. In process II, sulfuric acid is added to form calcium sulfate. In process III, potassium sulfate is added in the first ammoniator and to the partially dried slurry to form calcium sulfate and potassium nitrate. In process IV, gaseous carbon dioxide is added

Table 1. Principal Reactions in the Nitric Acidulation Processes

Process I

$$Ca_{10}F_2(PO_4)_6 \xrightarrow{16\ HNO_3 + 4\ H_3PO_4\text{(acidulation)}} 6\ H_3PO_4 + 2\ Ca(H_2PO_4)_2 + 8\ Ca(NO_3)_2 + 2\ HF \quad (1)$$

$$9\ CaHPO_4 + NH_4H_2PO_4 + 16\ NH_4NO_3 + CaF_2 \quad (2)$$

Process II

$$Ca_{10}F_2(PO_4)_6 \xrightarrow{12\ HNO_3 + 4\ H_2SO_4\text{(acidulation)}} 6\ H_3Po_4 + 4\ CaSO_4 + 6\ Ca(NO_3)_2 + 2\ HF \quad (3)$$

$$5\ CaHPO_4 + NH_4H_2PO_4 + 4\ CaSO_4 + 12NH_4NO_3 + CaF_2 \quad (4)$$

Process III

$$Ca_{10}F_2(PO_4)_6 \xrightarrow{20\ HNO_3\text{(acidulation)}} 6\ H_3PO_4 + 10\ Ca(NO_3)_2 + 2\ HF \quad (5)$$

$$6\ CaHPO_4 + 14\ NH_4NO_3 + 3\ CaSO_4 + 6\ KNO_3 + CaF_2 \quad (6)$$

Process IV

$$Ca_{10}F_2(PO_4)_6 \xrightarrow{20\ HNO_3\text{(acidulation)}} 6\ H_3PO_4 + 10\ Ca(NO_3)_2 + 2\ HF \quad (7)$$

$$6\ CaHPO_4 + 20\ NH_4NO_3 + CaF_2 + 3\ CaCO_3 \quad (8)$$

to the slurry in the ammoniation vessels to produce calcium carbonate. Other process details have been described. (15, 18, 16, 19, 23).

By proper selection of equipment and control of steps of drying, potash addition, screening, and recycling, granular homogenous products can be produced in each of the nitric processes. The nitric phosphates can be made with various ratios of nitrogen and phosphorus pentoxide. When smaller amounts of nitric acid are used, however, more of other acids are required and the economical advantage of the nitric acid acidulation is decreased. Estimated delivered wholesale prices for bagged nitric phosphates and mixed fertilizers are given in Table 2 (21). These estimates indicate that the nitric phosphate processes are economically feasible when compared with the conventional mixed fertilizer process. This is due, principally, to the lower production costs resulting from lower raw material costs.

Plant investment for the nitric phosphate process is estimated to be about 25% more than that for the conventional mixed fertilizer process. If, however, additional investment for granulation and working capital are included for the conventional process, investments for nitric acid acidulation and conventional acidulation would be approximately the same.

Another new acidulation process is a dicalcium phosphate process developed by Bridger et. al. **(5)** in which dicalcium phosphate fertilizer is produced by direct acidulation of the phosphate rock with mineral acids. The principle reactions involved are:

$$Ca_{10}F_2(PO_4)_6 + 3\ H_2SO_4 = 6\ CaHPO_4 + 3\ CaSO_4 + CaF_2 \quad (9)$$

for sulfuric acid acidulation, and

$$Ca_{10}F_2(PO_4)_6 + 3\ H_3PO_4 = 9\ CaHPO_4 + CaF_2 \quad (10)$$

for phosphoric acid acidulation. In equation 9, one mole of acid is required per mole of phosphorus pentoxide derived from the rock. This is one-half that required for the production of monocalcium phosphate in the present normal superphosphate process. Actually about 2.6 moles of acid per mole of rock phosphorus pentoxide is used in superphosphate production because of side reactions with calcium carbonate, calcium flouride, iron, and aluminum components, and other constituents of the rock. In equation 10, one-half mole of acid phosphorus pentoxide is indicated per mole of the rock phosphorus pentoxide for the production of dicalcium phosphate. This is one-fourth that required in the present triple superphosphate process. In actual practice, 2.3 moles of acid phosphorus pentoxide is used in triple superphosphate because of the side reactions.

The theoretical acidulation ratios indicated in equations 9 and 10 are not possible but considerable reductions in acid requirements over those for the present monocalcium phosphate process is achieved. The effect of the acidulation ratio in the treatment of phosphate rock by this process is shown in Figure 2, using monocalcium phosphate as the acid source.

The process consists of (1) mixing phosphate rock with phosphoric or sulfuric acid and water, or with monocalcium phosphate and water in proportions such as to convert part of the phosphate rock into monocalcium phosphate, (2) heating

Figure 2. Effect of acidulation in treatment of phosphate rock with monocalcium phosphate (conversion temperature, 185 C) (5).

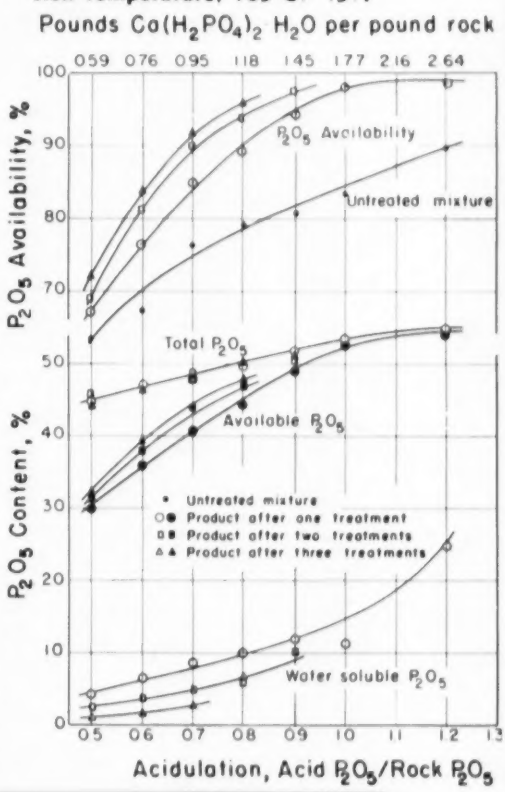
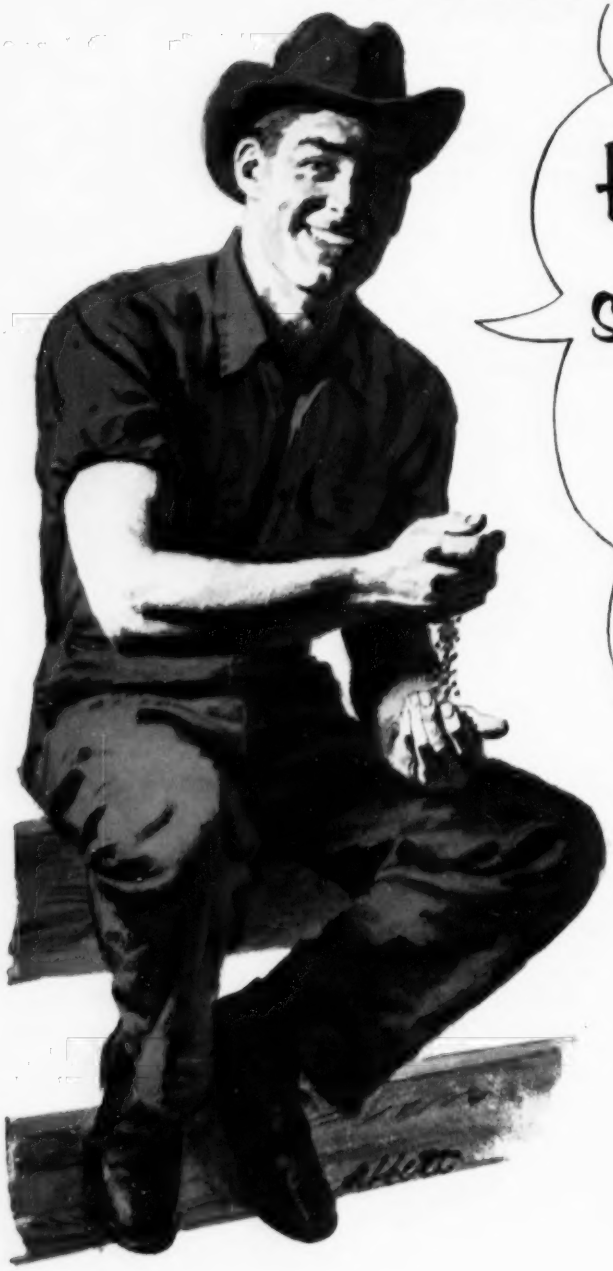


Table 2. Estimated Delivered Wholesale Prices for Bagged Nitric Phosphate and Mixed Fertilizers[1]

Process	I	II	III	IV	Mixed Fertilizer	II	Mixed Fertilizer
Grade of product	14-14-14	11-11-11	12-12-12	12-12-12	10-10-10	11-11-11	10-10-10
Capacity of plants, tons/year	50,000	50,000	50,000	50,000	50,000	200,000	200,000
Item	Dollars per Ton of Bagged Product						
Cost of raw materials	$39.91	$29.75	$34.38	$30.85	$38.06	$28.65	$38.06
Operating costs	13.78	14.45	14.04	14.04	9.78	10.60	7.56
Total production cost	53.69	44.20	48.42	44.89	47.84	39.25	45.62
(Total production cost per unit of plant food)	(1.28)	(1.34)	(1.35)	(1.25)	(1.60)	(1.19)	(1.52)
Selling and administrative expense	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Federal income tax	6.39	5.72	5.80	5.72	3.12	3.68	2.38
Return on investment	5.90	5.28	5.36	5.28	2.88	3.40	2.20
Freight for delivery of product	5.00	5.00	5.00	5.00	5.00	8.00	8.00
Delivered wholesale price	73.98	63.20	67.58	63.89	61.84	57.83	61.20
Delivered wholesale price per unit of plant food	1.76	1.92	1.88	1.77	2.06	1.74	2.04
(Selling price, f.o.b. plant)	(1.64)	(1.76)	(1.74)	(1.64)	(1.89)	(1.49)	(1.77)

[1]Taken from reference 21

BIG DAVE SAYS,



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the mixture at its boiling point under reflux for 30 minutes to promote the following reaction:

$$Ca(H_2PO_4)_2 \cdot H_2O + XH_2O = CaHPO_4 + H_3PO_4 + (X+1)H_2O \quad (11)$$

(3) drying the hydrolyzed mixture at temperatures from 130° to 185° C to promote reactions of the phosphoric acid formed by hydrolysis with additional rock, and (4) grinding the dried product and recycling.

The hydrolysis step is essentially complete in fifteen minutes and hydrolysis times longer than thirty minutes are not desirable. Maximum conversion is obtained at a free water content of approximately 14% and at conversion temperatures of approximately 185° C. Conversions of 95% or higher can be obtained over the temperature range from 155° to 245° C. The water soluble phosphorus pentoxide content of the products decrease rapidly over this temperature range, however. This makes it possible to produce fertilizer products having large or small proportions of phosphorus pentoxide in the water soluble form. The water soluble phosphorus pentoxide content also decreases with decreasing acidulation ratios as shown in Figure 2. The proportion of available phosphorus pentoxide in the water soluble form can thus be controlled by the acidulation ratio and the temperature.

When phosphoric acid is used as acidulant only half as much acid, based on the rock phosphorus pentoxide, or about 3/4 as much based on the available phosphorus pentoxide in the product, is required as with the usual triple superphosphate process. When sulfuric acid is used as acidulant, the saving in acid is less, but significant. Products made with phosphoric acid are almost as high in available phosphorus pentoxide concentration as triple superphosphate and those made with sulfuric acid are higher in available phosphorus pentoxide concentration than normal superphosphate. No curing of the product is required.

Advantages of the process are savings in acid requirements, high analysis products, elimination of the curing step in present fertilizer processes, and excellent physical properties of the product.

This process has not been developed on large scale pilot plant as yet, but preliminary investigations in small scale continuous pilot plant work have shown the process to be technically feasible and of commercial interest.

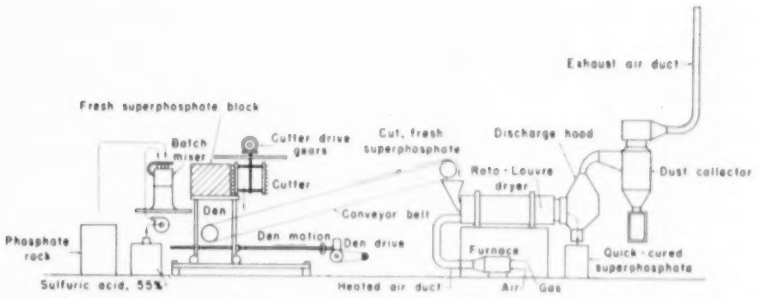


Figure 3. Flow diagram of quick curing pilot plant (6, 4).

Both the nitric acidulation and the dicalcium process effect a reduction in the consumption of sulfuric acid. This may become significant in the future if the expanding chemical field depletes sulfur reserves as happened some six years ago. Both of these processes afford a means of conserving our supply of elemental sulfur.

A significant development in the improvement of present superphosphate processes is a quick curing process developed by Bridger and Kapusta. **(6, 4).**

The process consists of acidulating phosphate rock ground to approximately 60% minus 200 mesh with 40-60% sulfuric acid in the proportion of 1.8 pounds of sulfuric acid (100% basis) per pound of phosphorus pentoxide in the rock, denning only long enough to allow the formation of a firm mass which can be easily disintegrated and dried in a Roto-Louvre drier. The flow diagram for this process is shown in Figure 3.

The conversion of fresh superphosphate made by this process ranges from 89-92% compared to about 82% when 71.8% sulfuric acid is used. On drying, the superphosphate gains from 1 to 3% in conversion. Maximum conversion is obtained with moisture contents from 12 to 15%. The degree to which the product is dried depends upon the use for which it is intended. For direct application, a low moisture content is desirable. For ammoniation or mixing, intermediate moisture content is desirable.

Thermal Processes

Significant developments have also been made in thermal processing of phosphate rock. These developments include fused phosphate processes and processes for production of elemental phosphorus for use in phosphoric acid or calcium metaphosphate manufacture.

The fused phosphate processes are an outgrowth of early work on defluorination by Elmore et. al. **(10).** For some years the Tennessee Valley Authority operated a defluorination plant near Columbia, Tennessee. **(14).** The process consisted of fusing briquetted mixtures of phosphate sand and raw matrix in a vertical shaft furnace to promote the following reaction:

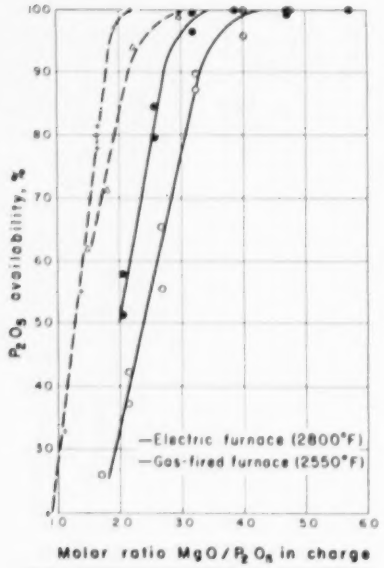
$$Ca_{10}F_2(PO_4)_6 + H_2O = 3\,Ca_3(PO_4)_2 + CaO + 2\,HF \quad (12)$$

The phosphatic constituent of the product was tricalcium phosphate. This operation has subsequently been abandoned because of difficulties encountered in corrosion of fusion furnaces.

During the development of the defluorination process Walthall and Bridger **(26)** showed that removal of the flourine content was not necessary to produce a soluble phosphate material when the fusion was carried out with phosphate rock and olivine or with magnesium silicate. A process was developed using an electric arc furnace for the fusion step. In this process phosphate rock and magnesium silicate ore were fused in a proportion of 0.46 pounds of olivine ore per pound of phosphate rock. The molten material was quenched, dewatered, dried, and pulverized. The product was a phosphate-magnesium silicate glass with high phosphorus pentoxide availability. Two commercial plants were built in this country, one in Washington and one in California, utilizing this process. In Japan and Formosa this process is used extensively.

Since this process was contingent upon low cost electric power, its development was limited in the United States. Recently, however, pilot plant work at Iowa State College **(9)** showed that the olivine phosphate rock process could be carried out in a gas fired furnace. Optimum charge ratios using natural gas are somewhat higher in the magnesia to phosphorus pen-

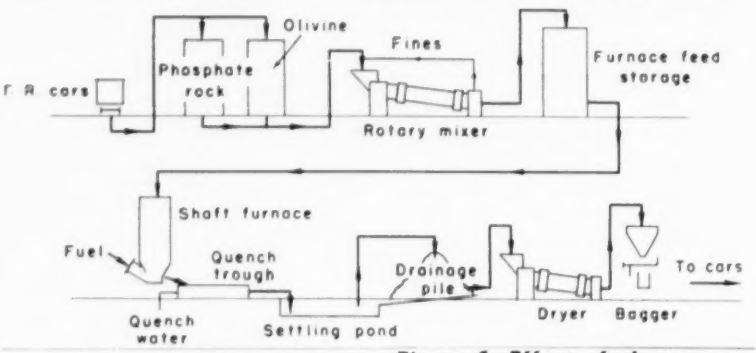
Figure 4. Effect of molar ratio MgO/P_2O_5 on P_2O_5 availabilty in electric and in gas furnace fused products.



toxide ratio as shown in Figure 4. The difference is attributed to the lower operating temperature of the gas fired furnace and the subsequent lower fluidity of the melt. Typical products from pilot plant runs show phosphorus pentoxide availabilities above 95% when charge compositions containing 35% rock and 65% olivine are used. A flow diagram for the process is given in Figure 5.

Subsequent developments at Iowa State College **(3)** showed that an excellent fertilizer material can be made by fusing phosphate rock with magnesium and potassium sulfate or with langbeinite. In this process langbeinite, obtained from Carlsbad, New Mexico, is mixed in a proportion of seven parts of langbeinite to three parts of phosphate rock, fused in a gas fired furnace, and subsequently quenched, dewatered, and bagged. The effect of

Figure 5. Flow diagram for the olivine-phosphate fusion process.

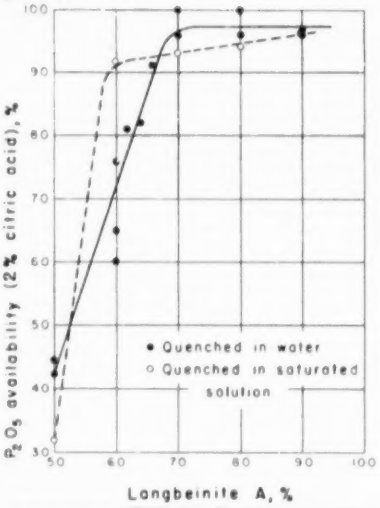


composition on phosphorus pentoxide availability of the product is shown in Figure 6. The process, developed on pilot plant scale, gives a product having typical compositions as shown in Table 3. The product has excellent physical characteristics, is granular, chalk white in appearance, and can be stored in open containers without caking. Preliminary economic studies indicated the process is competitive with the present superphosphate processes.

The fusion process is technically important in that it offers a means of conserving sulfur, since no acid is used. Natural sulfates, however, are readily adapted to the process. As an example, gypsum, obtained from Fort Dodge, Iowa, is being used in present studies at Iowa State College. **(2).** The process consists of the fusion of phosphate rock with dehydrated gypsum in the proportions of 65% to 70% with 30% phosphate rock. The product obtained has at least 10.5% total phosphorus pentoxide and 10.4% available phosphorus pentoxide. The product is granular, non-hygroscopic, and easily ground. Compositions of the product are given in Table 4.

Although the exact atomic relationships are not known for the fusion products, it is postulated by Boylan **(2)** that the anionmole ratio

Figure 6. Effect of charge composition on P_2O_5 availability of the langbeinite phosphate fused product (3).



of the molten material is controlling rather than the cation ratio. This postulation is based on the fact that phosphorus, sulfate, carbon, and silicate all have a tetrahedral arrangement of atoms as anion groups. Such an arrangement, i.e. a phosphorus, sulfur, or silicate atom with four oxygen atoms arranged around it at the points of a tetrahedron, would make the anion grouping relatively large compared with the calcium. The effect, structurally, would be dependent upon

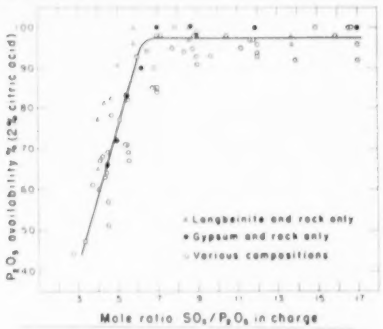
Table 3. Composition of Typical Langbeinite-Phosphate Rock Fusion Products[1] (%, dry basis)

Pilot Plant Samples	Product Composition					Mole Ratio of Products[2]		Available	Availability				
	P_2O_5	K_2O	MgO	SO_4	F	K_2O / P_2O_5	MgO / P_2O_5	P_2O_5[3]	K_2O	MgO	P_2O_5	K_2O	MgO
PP-4	10.1	13.1	11.8	40.0	1.6	1.95	4.10	9.5	12.0	11.2	95	92	94
PP-5	9.8	12.5	11.3	41.7	1.6	1.93	4.05	9.6	11.6	11.3	98	93	100
PP-8	12.1	13.0	11.0	39.0	1.5	1.62	3.21	11.1	12.5	10.5	92	96	96

[1]Taken from reference **(3).** [2]Mole ratios K_2O/P_2O_5 and MgO/P_2O_5 in charge were 1.60 and 3.14, respectively, for laboratory fusions and 2.16 and 4.32 for pilot plant. [3]By 2% citric acid method.

the characteristics of these groups. This postulation was tested by plotting the mole ratio of sulfate to phosphorus pentoxide in the charge for fusions of langbeinite, magnesium, and potassium sulfate against 2% citric acid availability. The correlation is shown in Figure 7. That

Figure 7. Effect of SO/P_2O_5 mole ratio on P_2O_5 availability in fused products (2).



a high degree of correlation exists is evident and an anion-mole ratio, SO_3/P_2O_5, of at least 6.0 in the charge is necessary to obtain a fused product of high phosphorus pentoxide availability.

Over the past two decades there has been a burgeoning growth of elemental phosphorus from electric arc furnace operations. This development came as a result of cheap hydroelectric power, improved electric arc furnace techniques and a growing need for phosphates in detergents, water treatment, and other uses. The early development of phosphorus from these furnaces was expensive and not economically suitable for the fertilizer industry. Today, however, with enlarged elemental phosphorus production and improved furnaces and techniques, coupled with the growing demand for high analysis fertilizer materials this industry has established itself as a major raw material producer for fertilizer manufacturers.

Elemental phosphorus today is approaching the 300,000 ton per year level and seven companies now operate 27 electric furnaces having a design rating of close to 450,000 Kva. (1) These are listed in Table 5.

The availability of elemental phosphorus has enabled the production of a relative pure phosphoric acid at a reasonable cost. Processes for such production were developed earlier by the Tennessee Valley Authority (24). Acid by electric furnace processes is proving competi-

Table 4. Composition of Products from Fusion of Phosphate Rock and Dehydrated Gypsum[1] (Fusion at 2450° F)

			Product Composition, %[2]				
			Percent P_2O_5			Availability, %	
				Available			
	Phosphate Rock %	Gypsum[3] %	Total	2% Citric Acid	Neutral NH_3 citrate	2% Citric Acid	Neutral NH_3 citrate
1	40.0	60.0	13.2	8.7	—	66	—
2	37.5	62.5	13.8	10.0	5.9	72	43
3	35.0	65.0	11.7	9.7	—	83	—
4	32.5	67.5	12.0	10.8	8.2	90	68
5	30.0	70.0	10.4	10.4	8.1	100	78
6	27.5	72.5	10.4	10.4	10.5	100	100
7	25.0	75.0	9.6	9.4	9.1	93	95
8	20.0	80.0	6.8	7.0	—	100	—
9	15.0	85.0	5.1	5.5	—	100	—

[1] Taken from reference (2)
[2] Averages of two or more fusions of 30 grams each
[3] Preheated for three hours at 500° F.

Table 5. Elemental Phosphorus Producers[1]

Company	Location	First Operation	Rating Kv.-Amp.	Type Furnace
Westvaco Mineral Products Div.	Pocatello, Idaho	1949	18,000	TVA No. 6
		1950	20,000	TVA No. 6
		1951	25,500	TVA No. 6
		1952	36,000	Round
		1937	8,000	Round
Monsanto Chemical Co.	Monsanto, Tennessee	1937	8,000	Round
		1937	8,000	Round
		1941	20,000	Round
		1948	25,000	Round
		1950	25,000	Round
		1952	30,000	Round
		1954	30,000	Round
	Monsanto, Idaho	1938	12,000[2]	
		1940	12,000[2]	
Victor Chemical Works	Mt. Pleasant, Tenn.	1940	12,000[2]	
		1941	12,000[2]	
		1947		
	Tarpon Springs, Fla.[5]	1951	25,000	
	Silver Bow, Montana	1952	25,000	
		1953	32,000	TVA No. 6
			16,000	Round
Shea Chemical Corp.[4]	Columbia, Tennessee	1937		Round
Oldbury Electro-Chemical Co.	Niagara Falls, N. Y.		12,000[6]	
		1950		TVA No. 6
Virginia-Carolina Chem. Corp.	Nichols, Florida Charleston, S. C.	1952	7,500	TVA No. 6
American Agricultural Chem. Co.	Pierce, Florida	1955	12,000	TVA No. 6

[1] Taken from reference (1)
[2] Design rating of these furnaces was 7600 Kv.-Amp. when installed. Each was boosted to 12,000 Kv.-Amp. in 1947.
[3] Design rating of this furnace has not been revealed, except that it is larger than the Mt. Pleasant furnaces.
[4] Second furnace, of 42,000 Kv.-Amp., is scheduled for completion in July 1956.
[5] Oldbury's first furnace began operating in 1897. A number of others built since then have been superseded by the three presently operating.
[6] Estimated rating, based on estimated annual production of 14,000 tons, a power factor of 90%, and 5.9 kw. per pound of phosphorus produced.

tive in many areas with wet processes for making other new fertilizer materials such as mono- and di-ammonium phosphates and liquid fertilizers.

A significant result of the elemental phosphorus industry is the development of a small phosphorus oxidation plant. This has opened up new possibilities for further production of high analysis goods in areas heretofore subject to high freight rates on the acid itself. It is a common practice for the large producers of elemental phosphorus to ship the elemental phosphorus from the producing center to other manufacturing outlets for conversion to phosphate to be used in pharmaceuticals. It is logical to suppose that this trend could be carried into the fertilizer manufacturing field by shipping the elemental phosphorus to the manufacturing locality where it would be converted to phosphoric acid and subsequently into high analysis goods. The present hindrance to such development is the freight rate on the elemental phosphorus. At present it is considered a hazardous chemical. With increasing experience and knowledge on the part of the transportation people in general, the freight rates will be reduced to a point where small phosphorus oxidation plants become economical for any area in the United States. This will materially affect the local producers, the local mixers, and the fertilizer consumption picture in general.

Another development resulting from the availability of elemental phosphorus is the calcium metaphosphate process reported by Tennessee Valley Authority. **(25)** This material is an excellent fertilizer containing 60-65% phosphorus pentoxide. The salt itself is probably a polymer, $(Ca(PO_3)_2)n$, but the degree of polymerization has not been established. The principal reaction in the production of calcium metaphosphate is

$$Ca_{10}F_2(PO_4)_6 + 7\ P_2O_5 + H_2O = 10\ Ca(PO_3)_2 + 2\ HF \qquad (14)$$

Curtis **(8)** has described equipment and operations for such a process.

In this process elemental phosphorus is burned with air in a combustion chamber and pulverized rock blown in as shown in Figure 8. The phosphorus pentoxide reacts with the pulverized rock to produce calcium metaphosphate directly as a molten product. This collects in the bottom of the combustion chamber and flows out continuously onto cooling rolls which chill it and discharge it in the form of flakes which are subsequently crushed to the desired size. About 3/4 of the phosphorus pentoxide from the combustion of the phosphorus reacts with the phosphate rock. The unreacted phosphorus pentoxide is absorbed in lumps or briquettes in a tower which also functions as a stack The P_2O_5/CaO ratio can be controlled accurately by the amount of pulverized rock injected into the combustion chamber.

Plant operations at Tennessee Valley Authority demonstrated this process to be feasible in a furnace having a capacity of approximately 120 tons per day. Typical analysis of the calcium metaphosphate product is given in Table 6. In the process, about 80% of the flourine charged in the phosphate rock is volatilized. To inhibit caking of the product, 2 to 4% ground limestone is mixed with the ground flakes. This probably forms dicalcium phosphate with the monocalcium phosphate produced by hydrolysis of the dicalcium phosphate.

Table 6. Typical Analysis of Calcium Metaphosphate[1]

	Per cent
P_2O_5, total	63.6
P_2O_5, water soluble	0.8
P_2O_5, citrate insoluble	0.7
CaO	26.6
SiO_2	5.4
$Fe_2O_3 + Al_2O_3$	2.5
F	0.2
CO_2	0.9

[1] Taken from reference **(8)**

Metaphosphate of alkaline metals can also be produced by a similar process to that of calcium metaphosphate. Potassium metaphosphate, a potentially valuable fertilizer, is such a product. The following reaction

$$KCl + HPO_3 = KPO_3 + HCl \qquad (15)$$

goes substantially to completion at temperatures above 700° C. The process is similar to the calcium metaphosphate process. Compositions of the products produced at Tennessee Valley Authority vary from 55% to 58% P_2O_5 and 35% to 38% K_2O. Products containing metaphosphates of both potassium and calcium, and of variable compositions, can be made a similar way. Field tests have shown the materials to be excellent fertilizers.

Another new process depending on the use of phosphorus pentoxide vapors is that of ammonium metaphosphate described by Stinson **(22)**. In this process a concentrated fertilizer containing 90% plant food—17% nitrogen and 73% phosphorus pentoxide—is produced.

The process consists of (1) burning phosphorus with dried air in a combustion chamber to produce phosphorus pentoxide vapor, (2) reacting phosphorus pentoxide vapor with gaseous ammonia at temperatures of 600° to 1000° F. in a reaction chamber to produce a solid intermediate product of desired nitrogen—phosphorus atomic ratio, (3) collecting this intermediate product in an electrostatic precipitator, (4) hydrolyzing and agglomerating the intermediate material in a rotary tumbler at about 250° F. with steam and (5) crushing and screening the final product. A flow diagram of the process is given in Figure 9. *(See page 32)*

The reactions are postulated as follows:

$$P_4 + 5\ O_2 = P_4O_{10} \qquad (16)$$

$$P_4O_{10} + 4\ NH_3 = 4\ (HO)_2 + 2\ H_2O \qquad (17)$$

$$(HO)_2PN + H_2O = NH_4PO_3 \qquad (18)$$

$$(HO)_2PN + NH_3 = PNO_2HNH_4 \qquad (19)$$

$$PNO_2HNH_4 + H_2O = NH_4PO_3 + NH_3 \qquad (20)$$

Figure 8. Combustion chamber for calcium metaphosphate production (8).

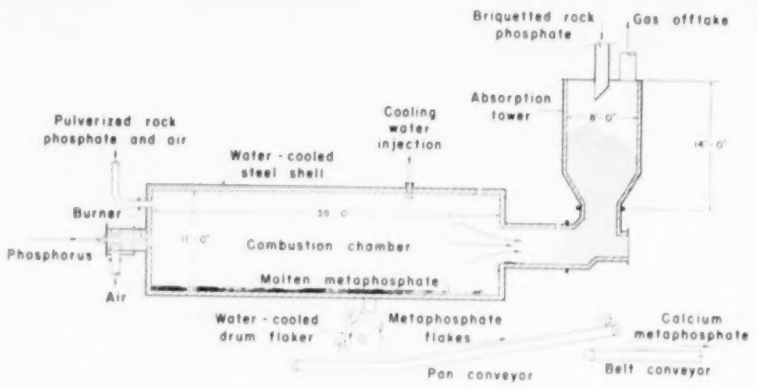


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Figure 9. Flow diagram for ammonium metaphosphate process (22).

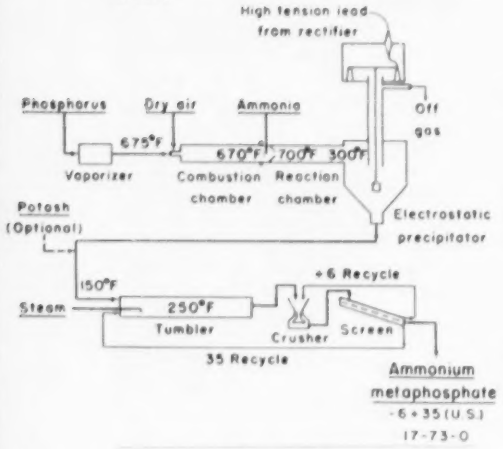

Table 7. Typical Analyses of Intermediate Product and Ammonium[1] Metaphosphate Fertilizer Produced in Pilot Plant Operation

	Analysis, Wt. %	
	Intermediate product	Ammonium Metaphosphate fertilizer
Nitrogen, %		
Total	18.3	16.7
Ammoniacal	12.9	13.8
Water-soluble	11.0	11.7
Water-soluble N, % of total N	60.0	70.0
Ammoniacal N: total N atomic ratio	0.70	0.83
P_2O_5, %		
Total	76.8	73.4
Available	76.0	70.7
Water-soluble	46.3	51.2
Availability, % of total P_2O_5	99.0	96.5
Water-soluble P_2O_5, % of total P_2O_5	60.0	70.0
Product N:P atomic ratio	1.21	1.14
Ammonium metaphosphate content (calcd.), %	66.0	81.0

[1] Taken from reference **(22)**

Typical chemical analysis of the products are shown in Table 7. The product is granular and non hygroscopic. It contains 80 to 86% ammonium phosphate in which 20 to 30% of the nitrogen is a form that is slowly soluble in water. Potash may be added during the hydrolysis step to produce a complete fertilizer. Crop response of greenhouse studies in Sudan grass, red clover, and rye grass indicate group response to phosphate equal to or better than that in concentrations of superphosphate or calcium metaphosphate.

Mixed Fertilizer Processes

Developments in the fertilizer field would not be complete without mentioning those that have occurred in mixed goods. Mixed fertilizer is the principal form used by the farmer and it makes up approximately 70% of the fertilizer he consumes. The grade of mixed goods has increased steadily over the past two decades. In 1955 the average grade was 28% total plant food in all mixed fertilizers. In some areas this is higher, of course, such as the west north central states where the grade is approximately 35% plant nutrients. This advance in high analysis of mixed goods has not taken place without other technological advances. Significant are ammoniation and granulation.

Ammoniation, an integral part of mixed fertilizer manufacture and granulation, last year consumed approximately 24% of the total nitrogen used as fertilizer. Ammonia and ammoniating solutions (containing ammonia, ammonia nitrate, or urea) are the basic forms of nitrogen available to the firms who manufacture. The extent to which superphosphate in early ammoniation products could be ammoniated represented a limitation in the amount of nitrogen that could be incorporated in the mixtures. It is common practice now to add sulfuric or phosphoric acid to increase the nitrogen content.

The principal ammoniation reactions are as follows:

$$H_3PO_4 + NH_3 = NH_4H_2PO_4 \quad (21)$$

$$Ca(H_2PO_4)_2 + NH_3 = NH_4H_2PO_4 + CaHPO_4 \quad (22)$$

$$2\,CaHPO_4 + 2\,NH_3 + CaSO_4 = Ca_3(PO_4)_2 + (NH_4)_2\,SO_4 \quad (23)$$

$$NH_4H_2PO_4 + NH_3 + CaSO_4 = CaHPO_4 + (NH_4)_2\,SO_4 \quad (24)$$

$$NH_4H_2PO_4 + NH_3 = (NH_4)_2HPO_4 \quad (25)$$

$$3\,CaHPO_4 + 2\,NN_2 = (NH_4)_2HPO_4 + Ca_3(PO_4)_2 \quad (26)$$

Practical degrees of ammoniation with ordinary or triple superphosphate respectively are approximately 6 and 4 pounds of neutralizing ammonia per unit of available phosphorus pentoxide.

Mixed fertilizer production may range from batch processing with limited facilities to continuous processing with extensive raw materials and by-product facilities. Most granulation equipment consists of rotary driers and coolers together with ammoniation equipment such as screens, mills, etc., for sizing the product. Economies may be affected by the use of the continuous Tennessee Valley Authority ammoniator **(12)** which provides for a higher absorption of the ammonia and a better control of the composition and physical form. As an example of this type of mixing plant, a flow sheet of the process in use in Ark-Mo Plant Food Company at Walnut

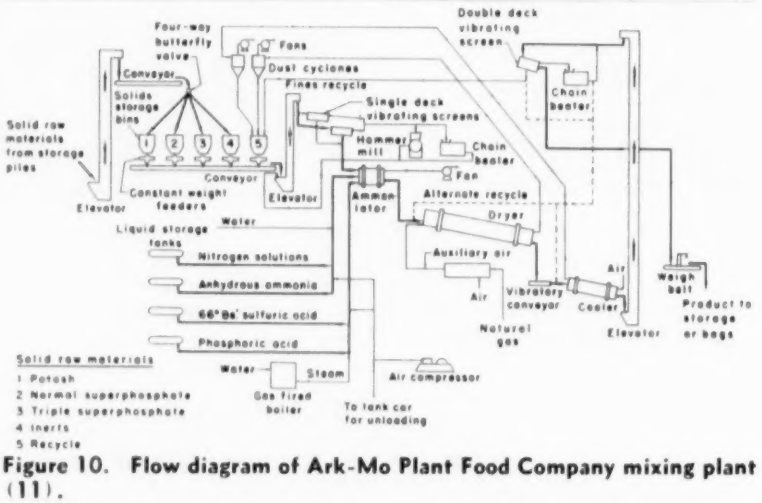

Figure 10. Flow diagram of Ark-Mo Plant Food Company mixing plant (11).

Table 8. Operating Data[1]

Grade	14-14-14[2]	14-14-14	12-12-12	10-10-10	16-20-10	10-20-0	2-9-27
	Flow Rates						
Process flow rates, tons/hour							
Product output	10	8	8	15	10	10	10
Recycle	21.6	27	24	27.7	21.6	6.8	4.5
Raw material feed rates, lb./hr.							
Nitrogen solution	5960	6096	5192	8145	8650	5400	1090
Ammonia, anhydrous	—	—	—	—	—	—	250
Sulfuric acid, 66° Be'	1330	1552	1192	1800	1360	—	—
Potash	4680	3744	3200	4995	—	—	9000
Superphosphate, normal	—	1680	5912	15375	6550	13300	9000
Superphosphate, triple	6060	4128	1656	—	6210	2960	—
Filler	—	—	—	1305	—	—	1110
Ammonium sulfate	3000	—	—	—	—	—	—
Gas flow rates, C.F.M.							
Natural gas consumption	33.3	35.0	35.8	58.3	61.7	58.3	58.3
Air flow through dryer	16700	14200	13500	13500	15600	14700	10650
Air flow through cooler	15000	15000	15000	15000	15000	15000	4095
Temperatures, °F.	Temperatures and Humidities						
Burner air	68	65	85	75	63	64	86
Ammoniator	185	180	175	175	190	160	205
Dryer throat	390	420	402	410	350	—	410
Dryer discharge	180	190	185	170	170	165	200
Cooler discharge	390	—	135	—	—	—	121
Finished product	125	120	120	125	115	85	120

[1] Taken from reference (11)

[2] Ammonium sulfate, 3 units

Ridge, Arkansas, is given in Figure 10. Ark-Mo combines ammoniation and granulation in one step. This plant has a capacity of 15 tons per hour. (11) It is designed to handle both solid and liquid raw materials.

In the ammoniator-granulator, all solid and liquid raw materials are mixed together. Air is blown on the moving bed of material by fans and steam is removed as exhaust. Material from the ammoniator is discharged to driers and then to a cooler by means of a vibratory conveyor. After screening, the properly sized product is continuously weighed and stored. Some thirty different degrees of mixed fertilizer are produced. Operational data on seven grades are given in Table 8.

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Facts Book Published by MCA

The Manufacturing Chemists Association has published the third edition of its Facts Book, a 160 page, profusely illustrated work which is available in single copies for $1.25, but which will be largely distributed by chemical concerns and the MCA, whose headquarters are at 1625 Eye Street, N.W., Washington 6, D. C. Bulk discounts are available.

INDUSTRY CALENDAR

Date	Organization	Place	City
May 17-18	NPFI Chem. Analysts School	Purdue Univ.	Lafayette, Ind.
June 9-12	NPFI	The Greenbrier	White Sulphur Springs, W. Va.
June 17-19	Sou. Control Officials	Dinkler-Tutwiler	Birmingham, Ala.
July 10-14	Plant Food Producers of Eastern Canada	Manoir Richelieu	Murray Bay
July 18-19	SW Fert. Conf.	Buccaneer Hotel	Galveston, Texas
Oct. 17	Chem. Control Procedures	Shoreham	Washington, D.C.
Nov. 3-5	CFA	St. Francis	San Francisco
Nov. 6-8	Fert. Indus. Round Table	Sheraton Park	Washington, D.C.

RESEARCH RESULTS & REPORTS

Soap may save cotton farmers millions of dollars if the new technique works out that is being tested at N. C. State. There, Dr. R. P. Moore has produced what he says are encouraging results in speeding germination of cotton seed. He sprays a soapy liquid on the seed before planting. This seems to break down the waxy film which covers cotton seed linters, and lets water get to the seed faster. Hence faster germination; hence a better and more uniform stand—because "a good stand is a fast stand" as every cotton man knows well. But, says, Dr. Moore—the spray must be a light one . . . no dunking!

O

Smoke has stepped up tomato yields by nearly a third, and beans by two-fifths in experiments in the Crimea. What's more, wine made from smoked grapes is better, and smoke raises the sugar content as much as 16%. The smoke is produced by burning red phosphorus. The technique was discovered when experiments were under way to protect lemon groves. The dense smoke not only cuts heat losses, but gives the plant a good dose of phosphoric acid, via the leaves. The old reliable Manchester (England) Guardian is authority for all this.

O

W. W. Lewis, VPI extension agronomist has computed the efficiency of fertilizer in terms of dollar investment in an interesting way. It seems to us that fertilizer salesmen could well use the simple, easily understood statements Mr. Lewis uses to back up his contention that fertilizer is the cheapest thing a farmer has to buy. For instance: "In tidewater Virginia the average cost per bushel for producing corn at the rate of 40 bushels per acre is $1.10. When the yield is raised to 80 bushels, the cost drops to 78 cents. When the yield reaches 100 bushels, the cost falls to 65 cents." Any farmer can understand that!

O

Seed purity may well be the determining factor in deciding whether a certain lot of farm seed should be used, according to Dr. B. E. Clark, at Cornell. There are three categories of seed impurity: inert matter, other crop seeds, weed seeds. While other seed weaknesses may be a factor, and cause a poor crop, impurities may contaminate a field for many crops to come.

O

Missouri now has 100 county soil testing units serving the farmer. Financed locally, they cost some $1200 each to set up, and considerable to keep running. So it is a significant fact that these 100 have all been developed during the past 10 years with one laboratory, which grew to 25 two years later . . . and the movement really started snowballing from that point.

O

"With truly adequate and hard-hitting programs of research and promotion, cotton can reign as King of Fibres for a long time" said the president of the National Cotton Council recently at a meeting of the Texas

Cotton Ginners Association. He looks forward within five years time to a normal domestic market of 11,000,000 bales, and exports up to 9,000,000 bales. "The sooner we start, the sooner we will realize the benefits" was his snapper.

O

Hay crop income in Illinois could be boosted more than $69,000,000 if farmers would use the best soil treatments they already know how to use. This is based on 1956 yield figures worked up by A. L. Lang, U. of Illinois agronomist, and quoted in Steve Turner's Farm News.

O

CFA backs this specific with a general statement along the same lines in a recent bulletin: "Increasing use of modern farm production aids has made it possible for the American farmer to nearly double his crop volume since 1940 . . . and fertilizer has been one of the most important factors in this development."

O

Clover seems not to like nitrogen, and as we seem to understand that pasture people are frowning on clover these days, that can be a guide to fertilization. The Kentucky AES finds that a higher percentage of clover stayed in test pastures when K and P were used without N/. "Heavy N applications upped the poundage of dry matter per acre, but clover content dropped considerably. To clover or not to clover, that is the question.

O

A net profit of $252,000,000 to farmers in the Delta in the last 10 years has been credited to anhydrous ammonia by Perrin H. Grissome of the Stoneville station.

O

Blueberries can be grown in non-swampy land a mountaineer near Blowing Rock, N. C., has figured out. He adds sulphur to his hillside acreage, producing the type of acid soil the berries seem to like best. He gets an average of seven pints per bush. His name, in case you want to look him up, is D. A. Klutz, Jr.

O

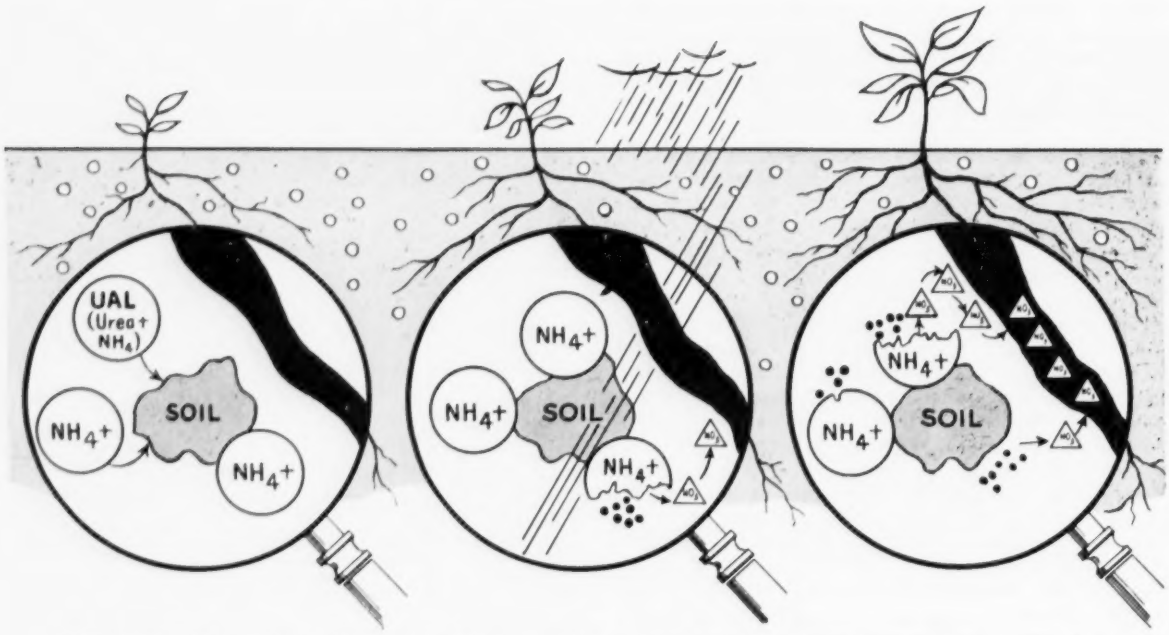
Trees will be the theme of this year's annual field day at the Connecticut AES at Mt. Carmel.

1956 SUMMARY OF GEORGIA BALE AND HALF COTTON CLUB

A summary of the Bale and Half Cotton Club records showed the amount of fertilizer, poison, and other practices actually used by the members of the club. The table shows a comparison of the production practices used by the club members and the practices of the average Georgia farmer. 10 Farmers averaged 1013 pounds of lint per acre on 126 acres. 42 farmers averaged 832 pounds of lint per acre on 960 acres.

	10 Year State Average	1½ to 2 Bales	2 Bales & Over
Average Yield Per Acre	275	832	1013
	$N-P_2O_5-K_2O$	$N-P_2O_5-K_2O$	$N-P_2O_5-K_2O$
Fertilizer Per Acre	33-40-46	78-80-108	82-96-109
Number of Times Poisoned Per Acre	4	10	12
Total Cash Cost of Production per Acre	75.80	149.57	177.87
Value of Crop	90.75	274.56	334.29
Profit Per Acre	14.95	125.03	156.42
Cost Per Lb. of Lint Cotton Produced	.28	.18	.17½

Cost of labor, fertilizer, insecticides and cotton prices were given average prevailing prices.



1. Du Pont UAL provides fertilizer mixtures with urea and ammonium nitrogen. In the soil, urea quickly converts to ammonium nitrogen, which attaches to the soil particles.

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Fertilizers ammoniated with Du Pont UAL have extra sales appeal because they are composed of two highly efficient forms of nitrogen. These forms—urea and ammonium—supply nitrogen that nourishes plants at the rate required for maximum growth and yields.

Nitrogen from Du Pont UAL resists leaching—remains in the root zone where plants readily absorb it. Thus, on the basis of units of nitrogen actually available to plants, UAL is a very economical investment.

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- Gives mixed goods better "feel"—minimizes caking, segregation and dusting.
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- Prompt, dependable delivery enables you to schedule your production with confidence.

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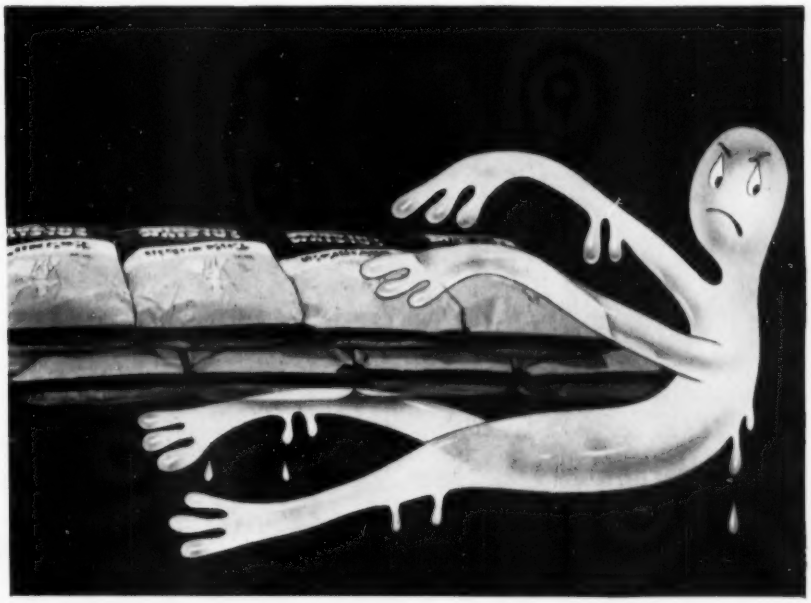

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TVA Pilot-Plant To Demonstrate New Fertilizer Processes June 18-20

Tennessee Valley Authority's Office of Chemical Engineering will hold a pilot-plant demonstration of some of its latest developments in fertilizer technology at the Wilson Dam Laboratories near Sheffield, Alabama, on June 18, 19, and 20. The demonstration will center around use of the TVA-developed continuous ammoniator.

The purpose will be to show how this equipment can be used to produce cheaper, better, or higher analysis fertilizers.

A series of pilot-plant runs will be made, each run designed to illustrate a different process or the use of new combinations of raw materials. All members of the fertilizer industry, the press, and other interested persons are invited to attend.

Tours will be arranged for those who wish to see the TVA fertilizer manufacturing facilities and the chemical and agronomic research laboratories. Those planning to attend the demonstration are requested to notify J. H. Walthall, Director of Chemical Development, Tennessee Valley Authority, Wilson Dam, Alabama.

Each pilot-plant demonstration will be preceded by a discussion period of about 45 minutes.

Following is a brief description of the new methods to be demonstrated and their unique features.

Use of Diammonium Phosphate: The availability of diammonium phosphate (21-53-0) has increased recently since several ammonium sulfate manufacturers have converted their plants to the production of this material. The use of diammonium phosphate in the production of granular fertilizers has the advantages of permitting higher analysis than can be obtained with conventional materials and increasing the water-soluble P_2O_5 content. Substitution of diammonium phosphate for other raw materials also is helpful in controlling granulation and reduces the drying requirements in some grades.

The demonstration run will show the production of 12-24-12 from diammonium phosphate, concentrated superphosphate, ordinary superphosphate, potassium chloride, and one of the new "dehydrated" nitrogen solutions.

Use of Phosphoric Acid Containing 76 Per Cent P_2O_5: Phosphoric acid containing about 76 per cent P_2O_5 is equivalent to about 106 per cent H_3PO_4. It is not produced commercially at present, but only minor changes in conventional phosphorus burning acid plants would be required for its production. Besides the obvious advantage of economy in shipping, this concentrated phosphoric acid has the property of producing more heat in granulation processes than is obtained with acid of normal strength. This additional heat, caused by dilution and hydrolysis of the acid, may be helpful in promoting granulation of grades in which more heat is needed for efficient granulation. It is helpful also in producing drier products.

The production of granular high-analysis fertilizer will be demonstrated using concentrated phosphoric acid, ammonia, ordinary superphosphate, and potassium chloride.

Ammonium Phosphate - Nitrates: Ammonium phosphate-nitrate fertilizers are produced by using phosphoric acid and ammoniating solution as the principal sources of P_2O_5 and N, respectively. Typical grades that may be produced are 16-48-0, 7-28-28, 16-16-16, 14-28-14, and 6-18-36. The advantages of the ammonium phosphate - nitrates are their high analysis and high water solubility. The economics of producing them depends on the cost of phosphoric acid and is favorable in many locations.

In the demonstration run, 8-16-32 will be made in the continuous ammoniation-granulation pilot plant from wet-process phosphoric acid, ammoniating solution, and potassium chloride.

Nitric Phosphate Using the Continuous Ammoniator: The use of the continuous ammoniator in the production of nitric phosphate is a modification of previous nitric phosphate processes developed by TVA. The previous processes required a rather large plant investment. The modification retains the economic advantage of using phosphate rock as the principal source of P_2O_5 but provides a method which can be used in many existing granulation plants with fairly minor additions and changes. The modified process can be used to produce grades such as 14-14-14, 12-12-12, and 10-15-20.

A 12-12-12 grade will be produced in the pilot-plant demonstration using phosphate rock, nitric acid, sulfuric acid, potassium chloride, and anhydrous ammonia.

Production of Ordinary Superphosphate for Immediate Ammoniation: Recent studies by TVA have shown that with the proper combination of operating conditions it is feasible to produce superphosphate that has high P_2O_5 availability and suitable physical properties for ammoniation after only 1 hour's retention in a den. Compared with the conventional procedure, a higher acidulation ratio, more finely ground rock, and a lower acid concentration are used in producing this superphosphate. In conjunction with a granulation plant, the use of this process, rather than the conventional method of producing ordinary superphosphate, would result in a saving by reducing inventories and would lower the cost of material handling.

Production of superphosphate of this type will be demonstrated in a pilot-plant cone mixer and a Broadfield-type den.

One-Step Process for Producing Granular Superphosphate: The continuous ammoniator is used in this case for acidulation and granulation. Phosphate rock and phosphoric acid, sulfuric acid, or a mixture of the two are fed to the ammoniator. Granulation is controlled by the addition of water or steam and by recycling fines from the process. The granules are cooled and screened. The fines and crushed oversize are recycled. Grades containing potash, such as 0-20-20, may be made by adding potassium chloride along with the rock and acid.

The demonstration will show the production of granular concentrated superphosphate from phosphate rock and wet-process acid.

A schedule of events planned for the demonstration follows:


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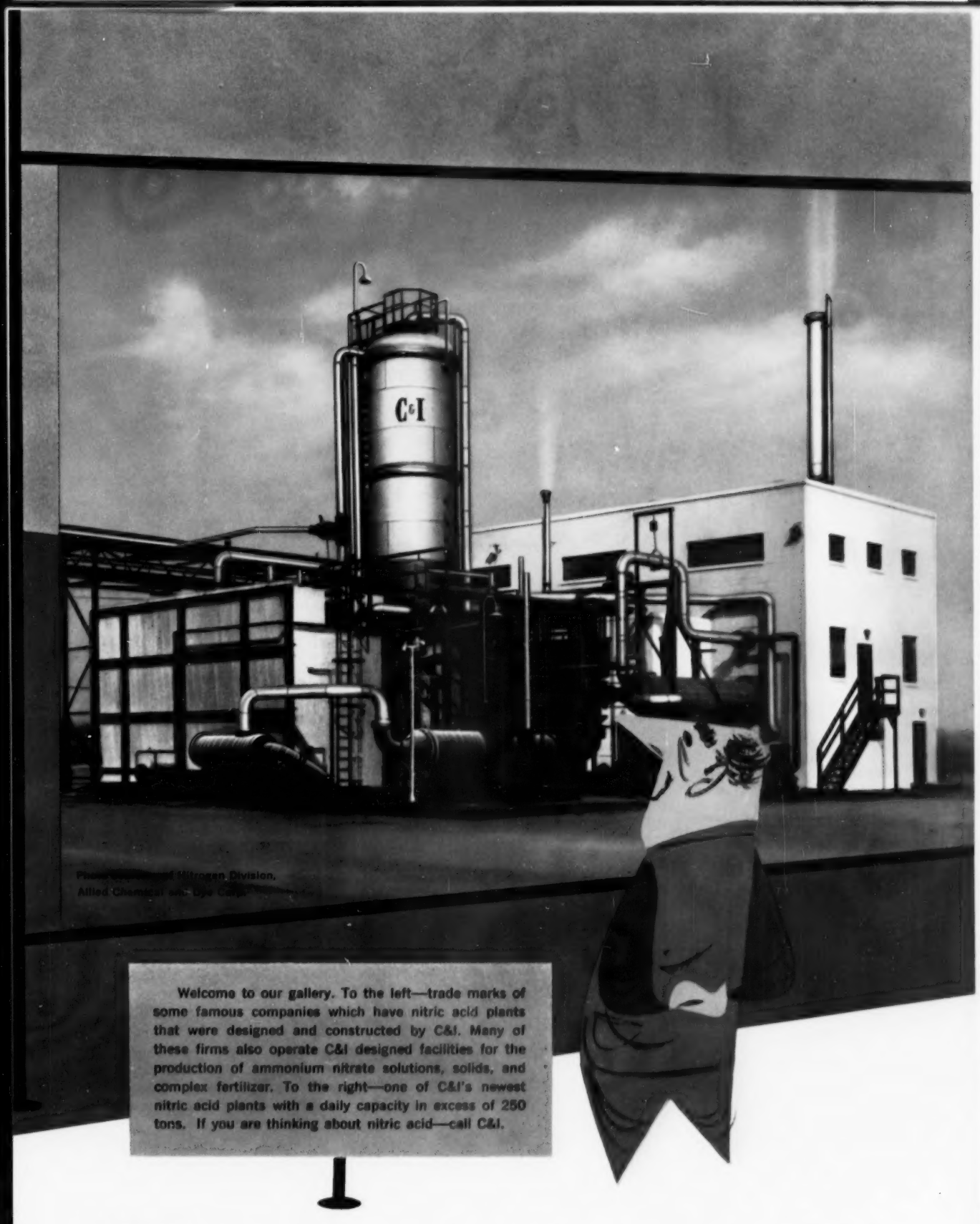

Welcome to our gallery. To the left—trade marks of some famous companies which have nitric acid plants that were designed and constructed by C&I. Many of these firms also operate C&I designed facilities for the production of ammonium nitrate solutions, solids, and complex fertilizer. To the right—one of C&I's newest nitric acid plants with a daily capacity in excess of 250 tons. If you are thinking about nitric acid—call C&I.

C I

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June 18

8:30 a.m. Registration
9:15 a.m. General meeting
10:00 a.m. Demonstration of use of diammonium phosphate in the production of granular fertilizer
2:30 p.m. Demonstration of use of phosphoric acid containing 76 per cent P_2O_5 in the production of granular fertilizer

June 19

10:00 a.m. Demonstration of production of granular ammonium phosphate-nitrates
Demonstration of production of ordinary superphosphate for immediate ammoniation
2:30 p.m. Demonstration of production of nitric phosphate using the continuous ammoniator

June 20

10:00 a.m. Demonstration of production of granular concentrated superphosphate.

TVA Workshop Hears Reports On Fertilizer Results

Agricultural experiment station researchers reported in a workshop-type session March 26-28 the many ways that fertilizers can affect crop yields. TVA agricultural economists and sociologists were hosts to the three-day conference.

Bruce I. Baird, North Carolina State College soils specialist, reported that corn planted on soil containing little organic matter responded to nitrogen applications more than did corn planted on soil that contained several times more organic matter. Fertilizer was applied at rates from 150 to over 400 pounds per acre.

Following Baird's discussion of fertilizer results, Roger Peterson, Oregon State College statistician, reported on plans for his institution's agronomic-economic research. Dr. John T. Pesek and Jack Doll, an agronomist and an agricultural economist from Iowa State College, said their fertilizer experiment was designed to find the following: "How total rainfall affects yields; how the amount and time of rainfall affect a crop yield; the effect of the available soil moisture at the time of seeding in relation to the amount of rainfall that falls during the crop season; and the generalization of these results—if practical, the two researchers added — from historical rainfall data."

The two Iowa fertilizer specialists are also studying how farmers can get the most results out of a dollar's worth of fertilizer—rather than how to obtain the greatest crop yields. One finding: Costs of obtaining a good stand of corn are low when compared with returns from higher yields.

Doctors T. E. Tramel and J. D. Lancaster, an agricultural economist and an agronomist from Mississippi State College, described their research with fertilizing cotton. The small plot work there is geared toward finding the most profitable methods by which farmers can grow cotton under a variety of soil and price conditions.

Dr. Fletcher E. Riggs, TVA agricultural economist, told the group that his regional agency has five specific objectives in the handling of its tributary watershed program: to help local people in the watershed; to help them with top-level state leadership; to identify specific watershed problems; to find satisfactory solutions to these problems; and, finally, to apply these solutions.

Richard Kilbourne, director of TVA's Division of Forestry Relations, also spoke on watersheds. His topic was "TVA's Tributary Watershed Program: Objectives and Techniques of Accomplishment."

B. W. Ellertsen of the Forestry Division said that TVA is considering a series of forest fertilizer tests. "The effects of fertilizer will be tested on tree seedling production in the nursery; on the reproduction of new forest stands, either artificially or naturally; on the production of wood and special products; on the production of seed; and on the control of insects and diseases," he said.

Ellertsen explained that "more information is needed about the effect of fertilizers on wood structure, on its specific gravity and fiber length and other characteristics affecting wood quality."

He also said that some tests have shown that tree mortality and other damage resulting from fungus and insect attack can be controlled or lessened by applying fertilizers to forests. Disease incidence is associated with a suspected nitrogen deficiency or low vigor of the trees in some areas. This sets up an opportunity for conducting fertilizer tests, Ellertsen explained.

Four Michigan State University researchers described results on the economics of fertilizer use on beans and potatoes. The combination field plot-greenhouse experiment was conducted by Doctors Glenn Johnson, W. B. Sundquist, J. F. Davis, and L. S. Robertson.

Jack L. Knetsch, economist from TVA's Agricultural Economics Branch, Division of Agricultural Relations, discussed progress on a supplemental irrigation study designed for the South.

Dr. A. J. Coutu, North Carolina

Top: Dr. George Stanford, E. G. Wiesehuegel, Dr. A. J. Coutu, and—far right—John C. Allen, congratulate B. W. Ellertsen, second from right, on his talk on tree fertilization. Wiesehuegel, Allen and Ellertsen are with TVA's Forestry Relations staff. Dr. Stanford is chief of the Soils and Fertilizer Research Branch in TVA's Agricultural Relations division, and Dr. Coutu is at North Carolina State College.

Bottom: Left to right are Doctors George M. Beal, V. W. Darter and Joe M. Bohlen. Dr. Beal and Dr. Bohen of Iowa State College explained "Social Action and Diffusion Practices" to the audience at the University of Tennessee Students during the conference. Dr. Darter, director of Extension Service at the University, discusses some points of the talk with the two speakers.

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- **Far more economical** than nitrate of soda, which contains only 16% nitrogen. You get more than *twice as much* of the valuable plant food, nitrogen, in every bag of LION brand Ammonium Nitrate than you do in any bag of nitrate of soda.
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FOR EASIER SPREADING, Lion Ammonium Nitrate is in pellet form. These pellets are specially coated to withstand caking . . . then packed in specially lined, moisture-resistant bags. Result: LION brand is *guaranteed* to flow freely—*not for just a year, but until used*—when you follow storage directions on the bag.

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2. **ORDER WHAT YOU NEED** of mixed fertilizer and Lion brand Ammonium Nitrate from your fertilizer dealer. When you buy LION, you get top-quality, low-cost nitrogen fertilizer *guaranteed* to flow freely; *guaranteed* to contain 33.5% nitrogen.
3. **APPLY THE FULL AMOUNT** of mixed fertilizer and Lion brand Ammonium Nitrate soil tests indicate. Don't skimp—fertilizer is the least expensive item you use for crop production.

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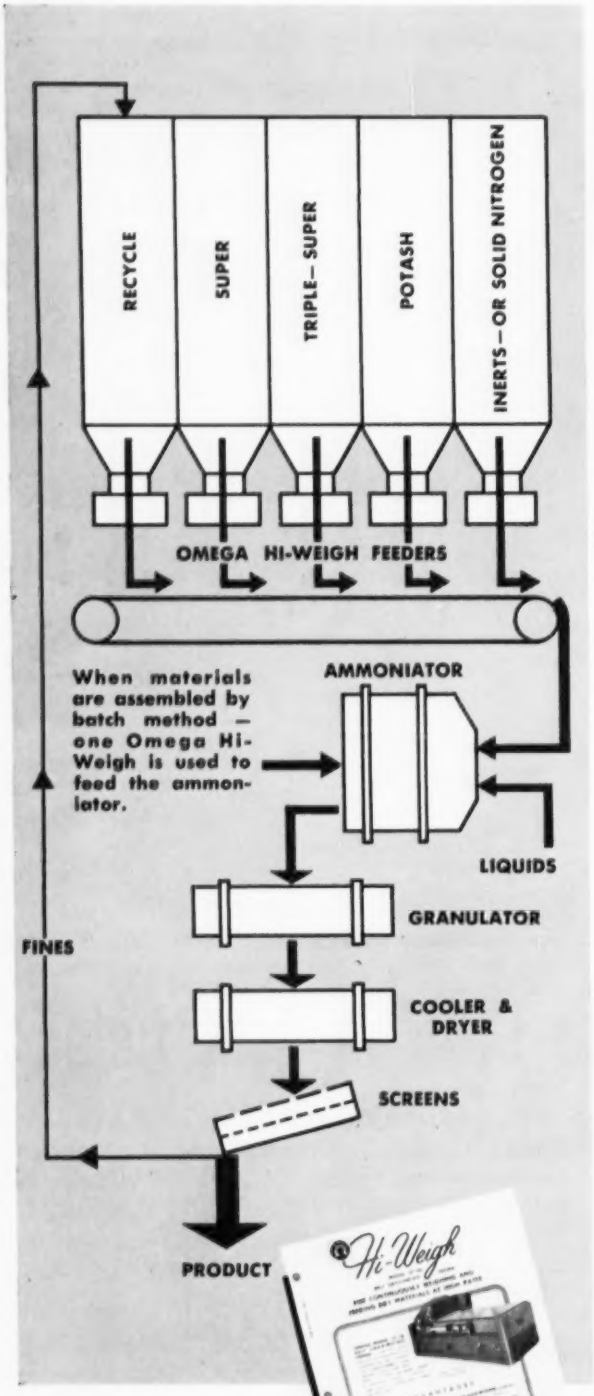

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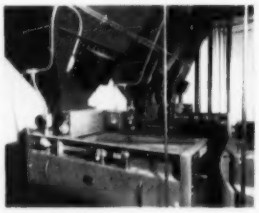
Users of Omega Hi-Weigh Feeders in ammoniation and granulation processes report they are hitting their analyses RIGHT! These continuous weighing feeders offer the two essential features which are vital to the fertilizer industry — high accuracy plus rugged construction. Omega Hi-Weigh Feeders may be used either for continuously proportioning raw materials and recycle directly into the ammoniator — or for feeding pre-formulated batches into a mixer which in turn discharges into the ammoniator.



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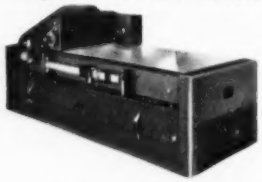

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High Accuracy — plus or minus 1% by weight within range.

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Rugged Construction — stainless steel for all metal parts in contact with material being fed. Bonderite pretreatment of all steel parts plus Plextone paint and corrosion resistant sealer to assure years of service in fertilizer plants.

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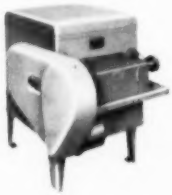

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B-I-F INDUSTRIES METERS FEEDERS CONTROLS

State College agricultural economist, reported on activities in Parker Branch Pilot Tributary Watershed, a 1,000-acre area northwest of Asheville, North Carolina. That project was designed to study the relationships between alternative uses of agricultural resources, the condition of soil and water resources and the welfare of the landowners.

A. J. Cooper, TVA hydrologist, explained that the conservation of water resources is not just flood control. It is also the use and management of water in the most sound and economical way. The effects of land cover can be evaluated by accurately measuring rainfall amounts and intensities and continuous rates of flow out of the watershed. The result is a study on how the cover influences water yield, consumptive use, rates of runoff and infiltration.

Dr. Earl O. Heady, agricultural economist of Iowa State College, said that farm planning research in Iowa showed that, generally, owner-operators of 160- and 240-acre farms could profit by controlling erosion mechanically, by as intensive rotations as can be used, and by fertilizing at much higher rates than are now being used.

Dr. Fred B. Saunders and W. Joe Free, economists at the University of Georgia, reported on how small commercial farmers in their state can increase their incomes. Opportunities include expanding the size of the farms; farming more intensely the acres farmers have already; fertilizing at heavier rates or by adding more farm enterprises; adding off-farm employment with the farm work, which becomes part-time farming; or by changing entirely to non-farm employment.

Dr. Roger C. Woodworth, another economist from the University of Georgia, presented the possible returns from an acre of Coastal Bermuda grass on large commercial Georgia farms. Cost of the fertilizer, labor needed, returns in protein, tons of hay, and income from a beef cow and calf program were some of the factors figured. Fertilizer costing $132 per acre for 1,200 pounds netted $235 per acre in hay, according to Dr. Woodworth's figures.

B. W. Ellertsen of TVA's Division of Forestry Relations told how foresters studied farm woodlands in the Parker Branch area so that they could plan such woodlands for greater returns. He predicted that farm planners will soon be able to classify farmland for forest purposes.

Dr. Earl R. Swanson, agricultural economist at the University of Illinois outlined a proposed research project which would explore the analysis of the area to be served by a bulk fertilizer blending plant, and which would outline a procedure for analyzing plant operations. Drs. George M. Beal and Joe M. Bohlen, Iowa State College researchers, told how a joint Iowa State-TVA project is aimed at learning how fertilizer dealers' services fit into their sales programs.

Dr. George Stanford, chief of TVA's Soils and Fertilizer Research Branch, Agricultural Relations Division, Wilson Dam, Alabama, outlined how new TVA fertilizer projects being developed might fit into commercial fertilizer plant and farm operations. Other fairly new fertilizer developments have been quickly adopted by the industry and are being used under royalty-free patents, Dr. Stanford added.

"Public workers have been the most active and full-time farmers the least active in a Mississippi community club study." This is what Dr. Wilfrid C. Bailey, Mississippi State College sociologist, told the conference.

"Most of the discussion and decision-making was carried out by a small handful of club members," Dr. Bailey observed.

Dr. C. Paul Marsh, North Carolina State College sociologist, reported on the joint North Carolina State-TVA part-time farming program being carried on in Transylvania County, North Carolina. These families receive educational help in providing themselves with an adequate home food supply; in learning how to grow the most farm products with the least amount of labor; and in producing livestock with superior stands of forage and pasture.

George V. Douglas and Dr. Arthur B. Mackie, a sociologist and an agricultural economist with TVA, bolstered other reports on the betterment of part-time farms. They said that continued investigations are needed to find ways to speed up the expansion of industry and of increasing the efficiency of agriculture in the South, including part-time farms.

Dr. Clifford Hildreth, agricultural economist at Michigan State University, spoke on a highly technical topic. His subject was, "Recent Experiences and Problems in Developing Experimental Designs to Fit Particular Research Projects."

Dr. Leland G. Allbaugh, director of TVA's Division of Agricultural Relations, set forth points to be discussed by a panel of discussion leaders. The subject was, "Capital and Credit Problems as They Affect Agricultural Resource Use." Discussion leaders were economists Dr. Howard Diesslin of the Farm Foundation, Chicago; Dr. Earl O. Heady, Iowa State College; and Dr. Glenn L. Johnson, Michigan State University.

How farm people accept new ideas was outlined to the conferees by Drs. George M. Beal and Joe M. Bohlen, Iowa State College sociologists.

Total attendance at this fourth annual conference was 75, from 13 states and Germany. Attending personnel represented primarily agricultural college research staffs, but included the U. S. Department of Agriculture and the fertilizer industry, as well as TVA.

Pacific N.W. Convening at Portland, June 26-28

Following is the tentative program of the 8th annual regional conference of the Pacific Northwest Plant Food Association, to be held June 26-28 at the Benson Hotel, Portland, Ore.:

TENTATIVE PROGRAM

Wed., Jun. 26—8:30 A.M.-11:30 A.M., Conf. Program

Wed., Jun. 26—Afternoon, Bus trip to Ore. City & Vancouver, Wash., Experiment Stations.

Thurs., Jun. 27—8:30 A.M.-11:30 A.M., Conf. Program

Thurs. Jun. 27—Afternoon, Bus trip to Ore. Farm Demonstration Project, Hillsboro, Ore.

Thurs., Jun. 27—6 P.M., Cocktail Hour

Thurs., Jun. 27—7 P.M., Annual Banquet & Entertainment.

Fri., Jun. 28—Conference, Technical & Scientific.

* * *

The association board elected Ray Whitcombe, Link Distributing, as a member of the board, replacing Bob Allard, resigned. He will serve until the next annual meeting. Northwest Nitro-Chemical was approved for membership.

The annual convention is scheduled for Sun Valley, Idaho, October 3-5. Get your skis all greased up!

Hillsboro will be the scene of the Oregon Farm Demonstration Project the middle of this month.

Land O' Lakes NEW PLANT SOLVES Neighbor Trouble

Can you build a new fertilizer plant and get it ready for production within six months? This was the question management of Land O'Lakes Creameries put to engineer-contractor firms before awarding a contract for its new plant at Minneapolis, Minn.

The officials were interested in new facilities and wanted to know if it was possible to have them available for the coming season, as even one month's delay in completing the plant would put the company behind the eight ball for that season, and saddle it with an idle investment for a full year.

The subject of a new plant came up in the spring of 1955. Market research and analysis of sales pointed out the advisability of the company marketing a granular type of fertilizer, and having it ready for the next season. Requirements for the production facilities were quickly firmed, conferences were held with engineering firms and by June the work was authorized.

Although experience of several producers indicated the time limit could not be met, the contract was accepted by Blaw-Knox Company's, Chemical Plants Division in July without qualifications; the Division to set up a fast engineering and construction schedule to meet the deadline set by the customer.

According to C. A. Johnson, manager of the Feed, Seed & Fertilizer Divisions of Land O'Lakes, the new plant was finished on time and met all performance expectations and production demands the first season. Phil Stocker, manager of the Fertilizer Division, reports that reception of the new granular product by farmers was enthusiastic. Consistent quality and uniform sizing of the product was responsible for the widest acceptance ever experienced by the company.

Liquid storage tanks and adjacent parking lot for neighboring manufacturing plant.

The schedule of work to be done by Blaw-Knox consisted of complete engineering and installation of tank-car unloading and liquid-storage facilities, processing equipment, building-steel work, dust collectors, painting, etc. Engineering was under way in August and ground was first broken in September. From then on it was a race against the weather, and equipment was placed as the building steel went up.

Despite the heavy snows and low temperatures of the Minnesota winter, the structure was housed in by November. The installation of small auxiliaries, control devices, and other finishing touches were done during December. Although the temperature ranged as low as 30 degrees below zero during the last stages of construction, the plant was ready for operation early in January of 1956, just six months after the contract was signed. Start-up assistance provided by the builder put the plant into production in time to fill all orders for the spring season.

Production kept up with demand although there was very little over capacity for storage. By the end of the fertilizer season more than 35,000 tons of granular product had been manufactured and shipped.

The plant was designed for maximum efficiency with minimum capital investment and operating costs, by utilizing existing building columns for the new building, and using the "stacking" arrangement of equipment to facilitate gravity flow and reduce the number of conveyors needed. A flexible arrangement permits the use of either gas or oil as fuel for drying.

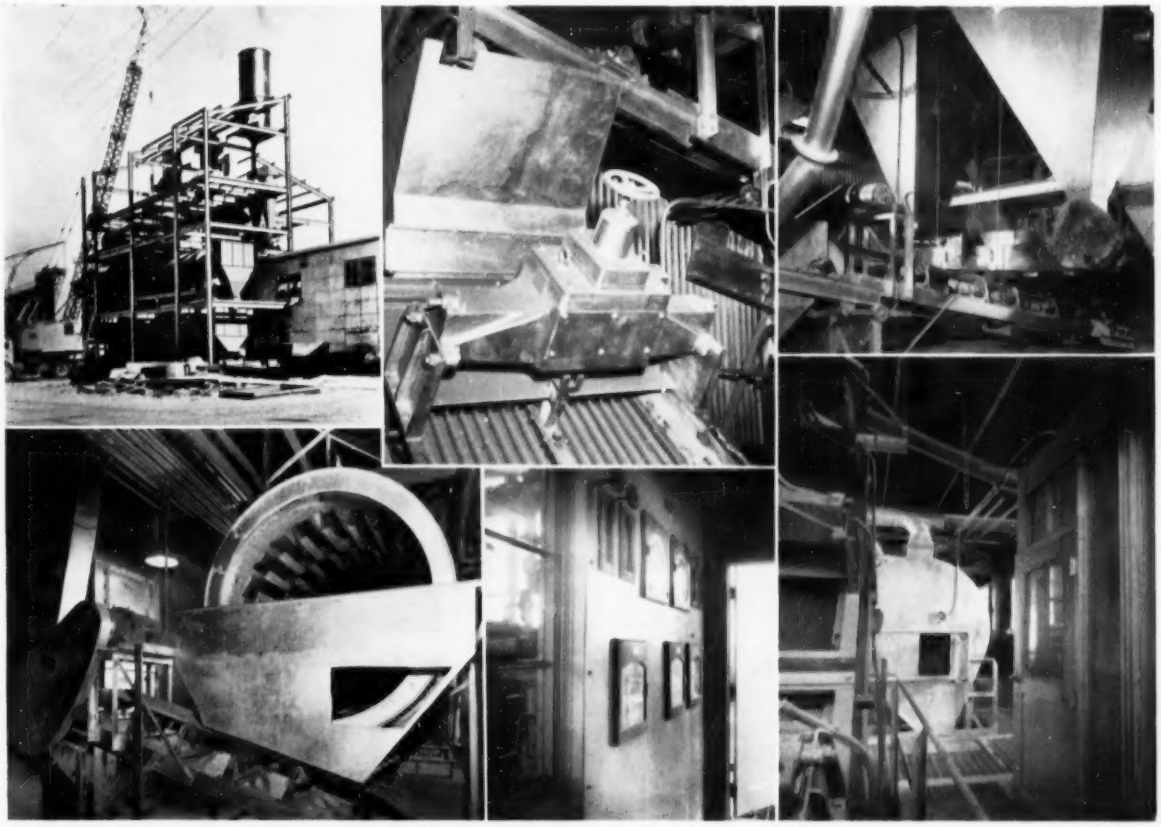
Another interesting feature of the plant is the installation of a complete dust collector system. Due to their sometimes—heavy dust production fertilizer plants are not always welcomed in built up areas, but the Land O'Lakes plant encountered no "neighbor trouble." One neighbor, Minneapolis-Honeywell Regulator Co., and the city air pollution control officials are pleased with the virtual elimination of dust, not only from the new plant, but also from previously existing facilities. Because of the nearby plants and a 3,000 car parking lot only 100 feet away, adequate dust collection was extremely important.

The process adopted for Land O'Lakes' new plant is the TVA continuous ammoniation and granulation system. It includes the continuous weighing of solid raw material, storage and automatic metering of liquids, ammoniation, granulation, co-current drying, countercurrent cooling, screening and recycle of the cyclone and screened fines.

The plant is designed for a production rate of 25 tons per hour of semi-granular, or 17 to 22 tons per hour of granular screened product averaging from -6 to +20 mesh size. Since fuel for drying is cheaper than the by-product chemical heat obtained from the reaction of acid with ammonia, equipment was sized liberally to permit maximum economy in formulation and low acid usage on all grades of product.

Stacking the processing components (Fig. 1) ammoniator, granulator, drier and cooler, provides complete gravity flow through these units and reduced the number of elevators and conveyors to a minimum. An inclined belt conveyor brings raw material to the screen (Fig. 2) from where it is distributed with mill tailings to nested surge bins with a swing chute, remotely controlled by the raw-material lift-shovel operator. The use of inclined conveyors to distribute raw materials (Fig. 3) and pick up the cooler discharge (Fig. 4) obviated the need for conveyor pits.

Thorough attention was given to hazardous conditions throughout the plant. This included a completely enclosed control room with an interior window giving a view of the ammoniator discharge (Fig. 5). In case of difficulty with the ammonia system an outside door in the control room leads to an escape



1. Stacking the processing components provides complete gravity flow through these units and reduces the number of conveyors to a minimum.
2. Raw material is delivered to the screens by an inclined belt conveyor from where it goes to surge bins.
3. Inclined belt conveyors distribute raw material from surge bins.
4. Last step in the process is the cooler, from where the product goes to storage and bagging stations.
5. The completely enclosed control room with interior window giving a view of the ammoniator and outer door to escape ladder.
6. Main operating floor with access from control room to granulator and other equipment.

ladder. The main operating floor (Fig. 6) provides access from the control room to the ammoniator, granulator, and product screen as well as the exhausters, cyclones and scrubbers of the dust collector system.

Control of dust is accomplished by wet scrubbers on the ammoniator and drier exhausts in the new plant, and exhausters, cyclones and wet scrubbers to take care of dust in the raw-material unloading and product-bagging areas in the existing plant. In the future, it is planned to install pumps which will recycle the scrubber water and sludge to the ammoniator for complete recovery of both soluble and insoluble materials removed from the exhaust streams.

ESCAMBIA BUILDING NEW CONNECTICUT RESEARCH CENTER

Construction of a research center at Wilton, Connecticut, by Escambia Chemical Corporation is now underway, according to Dr. Nat C. Robertson, vice president and director of research.

This new Center, a 50,000 square foot building on a 46-acre site, will provide for research and development activities and customer and technical service laboratories of Escambia. Specifically, its work will include research activities in petrochemicals, the plastics industry and in related fields.

Dr. Robertson will be in charge of the Center. He will be assisted with the business affairs by Robert G. Reed of Auburndale, Mass., as business manager.

Since Escambia Chemical was organized in 1954, it has conducted its own research and technical service activities at facilities in Cambridge and Newton, Mass., owned by National Research Corporation and will continue there until Escambia occupies its new Center early in 1958. Some sixty patent applications in the petrochemical field which were filed by National have now been assigned to Escambia.

Organized in 1954, Escambia Chemical opened its first unit, an ammonia and ammonium nitrate fertilizer plant, at Pensacola, Florida, in December, 1955.

Architect's drawing of Escambia's new research center building in Connecticut.

CHANGES

The Chemical and Industrial Corporation of Cincinnati has just announced that the tentative plans for a merger with the **Clopay Corporation** which had been reported in the press in February have been dropped and that negotiations in connection with the merger have definitely been terminated.

The Chemical and Industrial Corporation will continue its normal business of designing and constructing plants for the production of nitric acid, phosphoric acid, sulfuric acid and the further processing of anhydrous ammonia. No changes are contemplated in the corporate set-up or business of the Company.

* * *

A landmark of downtown Baltimore changed hands April 10 with the sale by **W. R. Grace & Co.** of the **Davison Chemical Building** at Fayette and Charles Sts., to **Blaustein Industries, Inc.,** which was announced jointly by **W. E. McGuirk, Jr.,** president of Grace's **Davison Chemical Company Division** and **Jacob Blaustein,** president of Blaustein Industries.

Simultaneously with the sale, Grace leased from Blaustein Industries approximately 70 per cent of the space in the building for a 15-year term. Mr. McGuirk made it clear that Davison would continue to occupy this space and that headquarters of the Division would continue in Baltimore.

* * *

Commercial Solvents Corporation stockholders approved the merger of **Thermatomic Carbon Company** into CSC at their 38th annual meeting April 4, 1957. Thermatomic's stockholders, at a meeting on April 2, 1957, approved the merger, which calls for an exchange of 18 shares of CSC stock for each share of Thrematomic. Commercial Solvents has managed Thermatomic, a manufacturer of thermal carbon blacks, since 1931 and holds approximately 68 per cent interest in that company.

J. Albert Woods, president of Commercial Solvents, informed stockholders that the Company's $10,000,000 plant expansion program started last year will be completed on schedule during the last half of 1957. Expansion at the Sterlington, Louisiana, plant, will increase the Company's methanol production by one-third. Among other projects is a new plant at Terre Haute, Indiana, for the upgrading of CSC basis industrial chemicals to additional chemical derivatives.

Northwest Nitro-Chemicals, Ltd., the Canadian agricultural chemicals operation in which CSC has a 42.7 per cent interest, is now producing a full range of mixed fertilizers at its new $22,000,000 plant in Medicine Hat, Alberta, Canada. Production of ammonium nitrate and ammonium phosphate fertilizers began in late 1956. CSC operates the company under a long term management contract.

* * *

The Farm Bureau Service Company, a part of the **Missouri Farm Bureau Federation,** announced it has bought a fertilizer plant in Montgomery County, Mo.

The plant, now annually producing 20,000 tons of fertilizer, is located on a 12-acre site 60 miles west of St. Louis.

The purchase was announced by **Earl Downen,** service company general manager.

Downen said the company "expects to make permanent improvements in the next two or three years," toward building up production to a potential 50,000 tons a year. The plant now employs 15 to 30 workers and the total is expected to reach 50 eventually.

* * *

A new corporation, owned jointly by the **Missouri Farmers Association** and the **Consumers Co-operative Association** of Kansas City, took over operation of the M. F. A. fertilizer manufacturing plant near Joplin, April 1.

The fertilizer plant, which was built in 1954 by the M. F. A., will become known as the **Farmers Chemical Company.** M. F. A. will hold 60 per cent interest, and C. C. A., 40 per cent.

F. V. Heinkel, M. F. A. president, will head the new company. **Howard A. Cowden,** Consumers Co-operative president, will be vice-president, and **R. J. Rosier,** another M. F. A. officer, secretary-treasurer. **Walter Horn** will remain as manager.

The plant produces mixed pelleted fertilizer.

* * *

Grace Chemical Company, a division of **W. R. Grace & Company,** announced concluding arrangements with the **American Vegetable Oils Corporation** of Lumberton, Miss., to operate their Anhydrous Ammonia plant at Hillsdale under the name of **South Mississippi Ammonia Distributors.**

The American Vegetable Oils Corporation Offices in Lumberton will be the headquarters for the company.

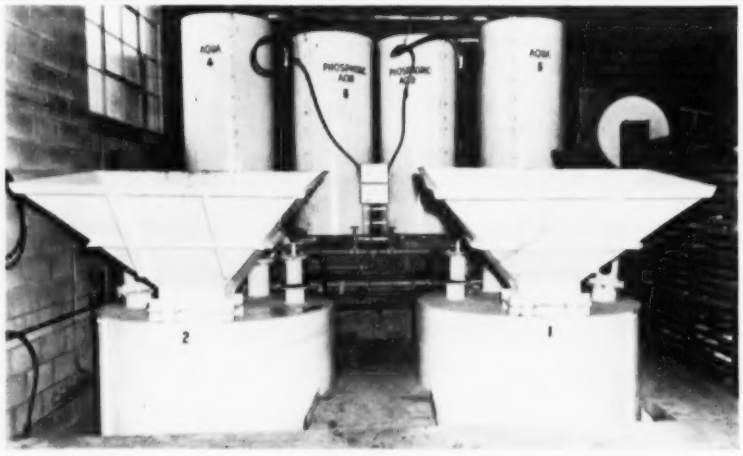
Marshall Ballard, Jr., has been retained as manager and he will be assisted by **Jack Bethea,** formerly of **Gulfport Fertilizer Company** to handle sales and services.

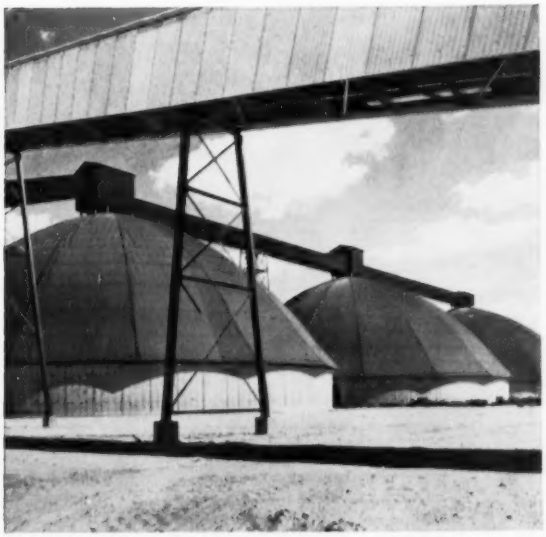
Future plans call for installing a bulk storage plant at Carriere.

* * *

Officials of **Farbenfabriken Bayer, A. G.,** the West German chemical firm which originated a number of agricultural insecticides, including Parathion and Systox, announce the formation of a subsidiary company, **Vero Beach Laboratories, Inc.,** in New York. This company will supervise Farbenfabriken Bayer's insecticide testing station at Vero Beach, Fla.

View inside new liquid fertilizer plant at Wakarusa, Ind., of Davison Chemical Company Division of W. R. Grace & Co. Davison entered the liquid fertilizer field with this plant the spring of 1956. The plant was constructed primarily for market research into the potentials of liquid fertilizers and methods of distribution and to prove the relative merits of liquid and dry fertilizer.





GREATER YIELDS for FERTILIZER MANUFACTURERS and FARMERS

NATIONAL POTASH supplies the fertilizer manufacturer with coarse and standard grade muriate of potash that is dust-free, free-flowing and of uniform K_2O content.

These qualities enable the manufacturer to offer a better product to the farmer for his plant food dollar.

NATIONAL POTASH COMPANY
205 EAST 42nd ST. • NEW YORK 17, N. Y.

ALABAMA

Stauffer's division, **Consolidated Chemical,** has completed a 500 daily ton, contact type, sulphuric acid plant at Le Moyne, where operations began March 1. This joins their acid plants in Houston, Baytown, Corpus Christi and Baton Rouge.

ARIZONA

U. S. Steel is engaged in a project which is a fantastic solution to one of the great engineering projects . . . how to get 100,000 tons of guano, valued at more than $10,000,000 from a cave in the almost sheer wall of the Grand Canyon, 600 feet above the Colorado River. A helicopter first spun the web which in turn became the longest single-span aerial freight tramway. Then a huge vacuum cleaner takes over. The project is being executed by U. S. Steel's **Consolidated Western Steel** division, for **New Pacific Coal & Oils Ltd,** Toronto, Canada, who have the lease on the cave. The guano is in powder form, odorless and ready to be used as a high nitrogen organic. The subsidiary is U. S. Guano.

CALIFORNIA

Fabricated Metals, Inc., San Leandro, are building four liquid fertilizer plants for erection at four widely separated points: For **Melville E. Willson Co.** at Madera; for **Fertilizers, Inc.,** at Linden; for **Farm Service, Inc.,** at Kimberly, Idaho; for **Delaware Valley Chemical Co.,** at Swedesboro, N. J.

* * *

Krause Manufacturing Co., Los Angeles, suffered severe fire damage to their fertilizer plant. The blaze, discovered by the night watchman, was extinguished within an hour.

COLORADO

Shell Chemical are adding to their Denver plant a new unit to produce methyl parathion, which is due to be ready this month.

FLORIDA

American Cyanamid have begun production at their plant at Brewster, cost not revealed, but similar to a plant which was built in 1954 at $10,000,000, and capable of producing 200,000 annual tons of triple superphosphate. **The Dorr-Oliver Co.** designed the phosphoric unit; **Chemical Construction** built the plant. **M. W. Chesson** is manager.

GEORGIA

Hydro-Pak Co., Savannah, has been chartered to manufacture and sell chemicals and equipment to increase productivity of waters. Incorporators are **Henry M. Dunn, B. B. Cubbedge** and **E. Ormonee Hunter.** Capitalization, $30,000.

IDAHO

Central Farmers Fertilizer Co. has awarded the general construction contract to the **Jacobsen Co.,** Salt Lake City, for its new $13,500,000 fertilizer plant at Georgetown. The plant is to produce calcium metaphosphate by the electric furnace method, according to company president **Joseph L. Lanter,** and distribution is to be handled by **Central Co-op Wholesale,** a member of CFF. **F. C. Torkelson,** Salt Lake City, designed the plant. Completion is scheduled for late next year.

ILLINOIS

Abbott Laboratories, North Chicago, are offering Gibberellic acids, and will, through their technical service representatives, provide aid in formulation or other problems. The product is in crystalline form, ready for commercial formulation. As our readers know, gibberellic acids stimulate faster growth, earlier germination, earlier flowering. Research has been completed on flowers, ornamentals, vines and small trees. Further research is needed before they can be recommended for food, feed and fiber crops.

* * *

Richfield Chemical, Sycamore, recently held open house at its new plant which manufactures and distributes liquid fertilizers. **Howard F. Kahn** is president.

* * *

Martin Implement has in operation its liquid fertilizer plant at Roanoke. Capacity is 20 hourly tons. A typographical error made this "Hartin" last month in a preliminary story.

* * *

Hy-Yield Soil Service, Mt. Caron, recently held open house to celebrate its first year of operation. The plant is a branch of **Illinois Utilities,** and is managed by **Rodell Rhine.**

INDIANA

Poseyville Grain & Feed, Poseyville, announced they will erect a new liquid fertilizer plant which is expected to be in operation by Fall. **Warner Reising** made the announcement.

KENTUCKY

Bartlett & O'Bryan, Owensboro, have set up a new liquid fertilizer plant to serve the area around Henderson and across the line into Indiana.

MARYLAND

Davison Chemical has announced three new fertilizers: Davco Gold, 15-15-15, granulated; Dav-Gro, 20-20-20, water soluble; Start-Rite, 10-52-8, also water soluble.

MASSACHUSETTS

Air Reduction Company plans a $9,000,000 plant at Acton to produce liquid oxygen, nitrogen and argon. Work will start at once, according to president **John A. Hill.**

MINNESOTA

Austin Drying Co., pre-processors of manure for commercial fertilizer, are planning a new, expended plant at Austin.

MISSISSIPPI

Coastal Chemical, Pascagoula, has signed a contract with **Titlestad** to furnish all engineering and equipment for the sulphuric acid unit which is part of their new high analysis fertilizer plant that is slated to be ready late this year. The equipment will start to arrive early in the Summer, according to executive vice-president **Owen Cooper.**

MISSOURI

Green Diamond Fertilizer, New Florence, held open house recently

The new office building at Bartow, Fla., of the Florida Phosphate Division, Davison Chemical Company Division of W. R. Grace & Co., which has been completed and now houses the 65 administrative, office and engineering personnel of the division. It is approximately 150 feet long by 70 feet wide, with 10,500 sq. ft. of floor space. Suitably landscaped, it is one story in height, of masonry block construction, air conditioned and centrally heated. Wellman Construction & Engineering Co., of Lakeland, Fla., drew the plans and were in charge of construction. W. R. Fort is manager of the Florida Phosphate Division.

to display its new granulating and screening equipment.

* * *

Holland Liquid Fertilizer, Holland, has opened its new plant, which represents a $50,000 investment. It is owned by **Pinnell Capehart, Kenneth Berry** and **Joe Coleman.**

NEBRASKA

Stauffer Chemical has completed a major expansion of its offices at Omaha, to accommodate the larger sales and production staff it now requires.

NEW JERSEY

American Cyanamid has officially broken ground for its $4,500,000 secondary sewage treatment plant at the Bound Brook works of its organic chemicals division. Division manager, **V. E. Atkins,** said that it will be one of the largest biological industrial waste treatment plants in the world.

NEW MEXICO

National Potash has put into operation its mine and refinery near Carlsbad, which can turn out 400,000 annual tons of muriate of potash and cost some $17,500,000. It is owned jointly by **Freeport Sulphur** and **Pittsburgh Consolidated Coal,** as our readers know who have followed step-by-step reports here on this plant.

NORTH CAROLINA

Bear Creek Mining, wholly owned subsidiary of **Kennecott Copper,** are optioning mineral rights around Washington for a project requiring 250,000 acres and is said to be a multi-million dollar phosphate investment.

OHIO

Zehr and Co. are building at Wausegon a complete new liquid fertilizer plant.

OREGON

Chase Bag Company has completed a new 160 x 170 foot warehousing and manufacturing building adjoining their Portland plant. It will release space in the main plant for expansion of operations there.

* * *

Donald Farmers Co-op, Oregon City, have installed a 16,000 gallon aqua ammonia tank, and have six applicators for custom service.

TEXAS

Olin Mathieson have in full production their $750,000 sodium silicofluoride plant at Pasadena.

VIRGINIA

F. S. Royster's South Norfolk plant was damaged by a $500,000 fire, the loss on which was covered by insurance.

* * *

Chatham Fertilizer Co. Inc., has been incorporated for $50,000 with headquarters in the Royster Building, Norfolk.

* * *

Virginia-Carolina has put to work its pilot plant in Richmond, which permits small-scale experiments with new products and new methods. It is complete in every possible respect, and was designed entirely by company personnel.

WASHINGTON

Pacific Supply are preparing plans to set up at Quincy a plant to blend fertilizer, minor elements and soil insecticides.

* * *

Edna Bay Pure Stone Co. of Dallas, Tex., plan a $5,000,000 limestone processing plant near Vancouver. They plan to ship limestone in from Alaska, and to process 300 daily tons.

* * *

Norkem Corp., Yakima, have moved into new quarters at 1001 S. 3d St., which was formerly the **John Deere** foundry building. **Dr. R. E. Jones** is president of the concern which was, until 1953 the Northwest Chemical Corp.

WEST VIRGINIA

Montecatini, whom we reported last month as studying plans for an American chemical fertilizer plant, have acquired 200 acres along the Big Sandy River, near Neal.

WISCONSIN

Kickapoo Fertilizers is in production with its new $300,000 plant at Stevens Point. It is a very modern operation with central panel control. **R. B. Baldridge** is manager. President of the concern is **Donald W. Aitken.**

AFRICA

Companhia Unao Fabril has announced plans for a plant of 140,000 annual tons of fertilizer and 40,000 of ammonia to be built in Angola, the Portuguese colony.

CANADA

Canadian Industries Ltd who recently announced a sulphuric plant at Copper Cliff, Ontario, now plan construction of a new 150 ton contact plant at Beloeil, Quebec.

* * *

Jefferson Lake Sulphur of New Orleans are planning a multi-million dollar plant at Calgary, Alberta, to produce 350 daily long tons of sulphur. They have a sub-lease from **Mobil Oil of Canada** on 80,000 acres of natural gas area.

INDIA

V. Uttamlal Mooni is looking for participation capital or long term credit with which to establish a chemical fertilizer plant. His address is Mustafa Building, Phorozshah Mehta Road, Bombay 1.

JAPAN

American Soybean Association has announced it will continue for 2 more years, and on an expanded scale, its market development plan for U. S. soybeans and soybean products, initiated in 1956.

KOREA

Honam Fertilizer Co. will use German money and German technicians to build in Naju a $20,700,000 urea plant. Preliminary surveys of the area, which is near Seoul, are now under way by representatives of three German concerns: **Demag, Lurgi** and **Siemens.**

PUERTO RICO

Gonzalez Chemical has gone into production with the first ammonia plant in the Commonwealth, at Guanica. The cost was $12,250,000 and it can produce 40,000 annual tons of anhydrous ammonia, via the **Texaco** sythesis gas process. A separate unit will turn out 115,000 annual tons of sulphuric acid, 130,000 of ammonia sulfate and some aqua ammonia. Annual sales are expected to reach $6,000,000.

Random NOTES & QUOTES

STRANGE things are happening, as Red Buttons used to say: Cabbage is growing 12 feet high, induced to this extreme by gibberellin . . . and with photographs in the paper to prove it. Crops are also coming in sooner, maturing two to five times faster under the urging of this new scientific wonder. Abbott, Imperial, Merck, Pfizer, and other producers are making tests that amaze, and marketing will soon be a general fact.

O

A Meteor whose fragments were sprinkled all over a lawn out in California turned out to be a pelletized fertilizer. The scientists who rushed to the scene slowly returned to their labs.

O

4711 is an eau de cologne brand name. It is also the phone number of a German dealer in manure. The courts had to decide that a man could use his phone number in his advertising, and the papers headed this tidbit "Manure Dealer Smells Victory."

O

Hexadecanol, a waxy chemical, is being poured on Lake Hefner, in Oklahoma City, to retard evaporation. We knew there were droughts out that way, but this seems like too much until you realize that the evaporation of that particular reservoir amounts, in a year, to the equivalent of a two month water supply for the city.

O

Grass sprayed green continues to amaze the populace. Dow Chemical workers demonstrated it recently on the lawn of the Grace A. Dow Memorial Library, and the town of Midland was aghast.

O

Shark liver is one of the ingredients of a plant food melange used by a gent in New Jersey to grow orchids. The man who is really a banker, and who grows orchids for his own amazement, uses milk, tomato paste, beet extract . . . all sorts of things. But there's no point in hunting him up so you can package the stuff. He says each variety is a matter of trial and error, and he can't help you. At least, not much.

O

Lazy people will cheer two things of recent import: Out in Kansas City the Safety Service has come up with a Lens Cleaning Station. This is a sort of one-stop service deal for eyeglasses—cleans, anti-fogs, and all with nice mechanized methods. That's one. The other is the fact that the Pennsylvania highway department has proved that spraying can take the place of mowing. And with Summer coming on, that should be a relief to one and all.

O

Airplanes are getting to be pretty important in agriculture. Some 5000 of them will soon start flying on their deadly mission, warring on the gypsy moth et al. It seems that last year more than $150,000,000 of crop chemicals were spread from the air. And of course we know about seeding, forest fertilizing and such from our own reading in this department. But here are some statistics, if you like the things: Last year more than 7,000,000 acres of crop and pasture land were air sprayed; more than 2,000,000 acres of forest.

O

Now comes U. S. Guano with a helicopter. Working like a big and noisy spider, this amazing type of machine has helped to thread the cables of a suspension bridge across the Grand Canyon of the Colorado so U.S.G. can get to the other side, where for untold prehistoric years bats have deposited in their kindly way guano which now can help the American farmer.

O

Plankton is to Peru what a good balanced fertilizer is to the typical American farmer . . . but indirectly. Plankton feeds anchovies; anchovies feed birds; birds make fertilizer, and fly on about their business. But plankton like cold water, and the Pacific stream along the Peruvian coast turned warm. The poor Peruvians are having a tough time because the plankton moved away . . . the anchovies followed . . . and the pelicans, ducks and guan birds were companions in misery with the Peruvians.

O

In New Hampshire in the last 12 years, farmers have created 739 farm ponds, which is an excellent measure of the soil conservation activity in that state, where more than 5000 land owners are actively enrolled in stopping soil erosion and other good land-management activity.

O

Plastic now replaces the silo. No longer will the towering tubes dot the landscape if the plastics division of Visking Company has its way. They have photos and supporting data, and sent us a sample of the black polyethylene film which converts an ordinary, garden-variety trench into a practical, successful silo.

Visking is a division of Union Carbide and Carbon.

O

75% of limestone transportation costs up to $2.50 a ton to help make limestone available to Ontario, Canada, farmers will be paid by the Ministry of Agriculture.

O

N.Y.A.E.S. which is celebrating its 75th anniversary, has been releasing little filler items to the papers. We thought you'd like to read a few extracts from these:

The Experiment Station at Geneva was created by act of the Legislature in 1880.

The Station grew out of "the necessities of farmers," according to Robert Swan, first president of the Board of Control, in his report to the Legislature in 1882.

* * *

Did you know that the Experiment Station has named and introduced 159 varieties of fruit since 1894?

* * *

Did you know that the first systematic study of plant diseases anywhere in the U. S. was done at the Experiment Station at Geneva in 1884?

* * *

Did you know that the Station maintains the most complete seed testing service in the U. S., with all kinds of seeds being tested for quality?

RED FACE DEPT.

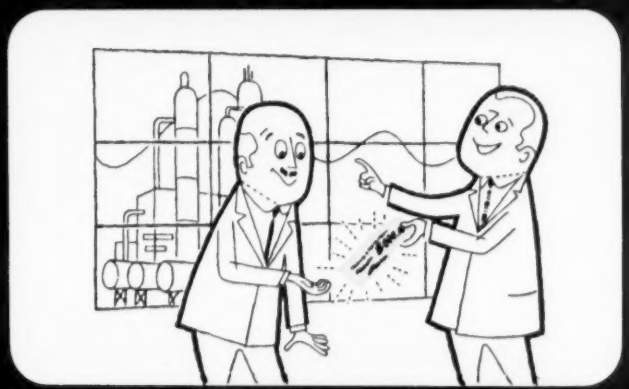
Last month we really tangled up an item in Random Notes. Nitrogen Division reported a potential reduction of 10 years in the time it takes to grow pulpwood as the result of work by Japanese forest scientists, and announced a 35 page booklet "Fertilizing Forest Lands" by Dr. Takeo Shibamoto, Professor of Forestry at Tokyo University.

They also said you can get a copy free by writing Dr. E D. Crittenden, Director of Research, Nitrogen Division, Allied Chemical & Dye Corp., 40 Rector St. New York 6, N. Y.

By some weird mischance we said the booklet was by DuPont, and if you wrote DuPont for it, we're sorry and hope you will try again.

When Lummus builds your new plant, you select the contract arrangement best suited to your needs. For example . . .

You may decide on a *lump sum* (turnkey) contract, where final cost can be fixed before work starts.



You may want Lummus to build on a *guaranteed maximum* contract. Any savings are then shared with you on a pre-arranged basis.

Or maybe you prefer a *cost-plus* arrangement. Your auditors and directors will cheer Lummus' astute purchasing.

Want to get on stream fast? A convertible *cost-plus* contract gets work started, can be changed to any other type after job is fully defined.

Whatever arrangement you choose, Lummus experience insures on-time completion, efficient operation.

Build your new plant on a "tailored" contract

The first money-saving step in building a new plant is to pick an experienced engineering and construction firm. The second is to make sure the contract is tailored to your needs. The Lummus Company will design, engineer and build your new facilities on any of the basic arrangements outlined above. And Lummus' 50 years of experience with more than 800 process plants all over the world, insures on-time completion, a smooth startup, efficient operation. It will pay you to talk over your plans with Lummus.

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Fifth California Conference Draws 250 to Fresno

250 persons took part in the Fifth Annual California Fertilizer Conference in Fresno on Monday, April 15. Sponsored by the California Fertilizer Association's Soil Improvement Committee, program interest centered on potash problems and on minor element deficiency symptoms and correction. These were the subjects of the two panel discussions. The program was held on the new campus of Fresno State College, with participants joining in a conducted tour of the facilities following the program.

Dr. Firman E. Bear of the Soils Department, Rutgers University, New Brunswick, N. J., was the featured speaker following the banquet at the Fresno Hacienda Hotel, on the subject "Land For Living." Dr. Bear said that there were, as of about 11 a.m. on February 17, 1957, 170 million people in continental United States, with the population increasing by one person every 12 seconds. A total of 3 million more are expected during 1957.

When the first permanent English settlement was established in Jamestown, Virginia, only 250 years ago, each of 800,000 Indians had the equivalent of 2400 acres. Today, our national land area per man has fallen to 11 acres, and in the year 2000, when our population should have reached 300 million, that area will have fallen to 6 acres.

He said we have in our country 1,904,000,000 acres of land on which we must depend. Of this vast area, more than one half—more than 1 billion acres — has only limited value. About 150 million acres is desert, 600 million acres is semi-arid, and 300 million acres in a semi-humid state, which is affected by dry desert winds. The desert produces no useful vegetation, the semi-arid area yields grazing for one steer on an area of 25 to 75 acres. The semi-humid area offers marginal possibilities for grain-growing, with ups and downs from year to year, depending on weather cycles.

One answer, he said, including the desert, lies in irrigation. Now 25 million acres of arid and semi-arid land is being irrigated, with enough more water in sight for perhaps another 25 million acres. Cloud-seeding and sea water reclamation are possibilities for new water sources which we are now hopefully exploring. He said that those possibilities cannot be lightly dismissed, but neither can they de depended upon for any great agricultural expansion. Among the problems involved in sea water reclamation is the cost of production, and the cost of transporting this water to areas of crop production. The Department of the Interior estimates the cost of production by modern methods at about 60 cents per 1000 gallons, or $200.00 per acre foot. Several acre feet are required for satisfactory crop production in arid areas. This cost is at the seashore, and does not consider its transportation inland and its elevation above sea-level. He said it will be a long time before much purified seawater gets far into the interior of the west.

Scientific agriculture is now producing enough more food and fiber than is required that we have a serious surplus problem. Development of synthetic fibers from non-agricultural materials has released 25 million acres of cotton land for food production.

He said that the fertilizer industry now provides 22 million tons of chemical fertilizers and 20 million tons of liming materials, and there are 500,000 tons of pesticides formulated and used each year in the United States. Production of these materials can be readily expanded. Anti-biotics, hormones, gibberellic acid, and other new chemicals are coming into agricultural use, and stilbestrol puts extra pounds onto beef cattle. Soil disinfectants are increasing yields very markedly.

Breeding of plants for hybrid vigor, greater capacity to withstand drouth and cold, and to resist attacks from insects and disease organisms is going forward. Similar methods are improving livestock for meat production. Farm machinery is continually being improved, as is packaging and new techniques for preserving foods.

We are losing one million acres of good farm land each year to industry, city, suburban, highway, airport and similar developments. Our most promising possibility for increasing food of the kind we now enjoy lies in better use of manpower, machinery, and chemicals. By these means and through continued research, agricultural production should be able to keep pace with population growth up to the end of this century.

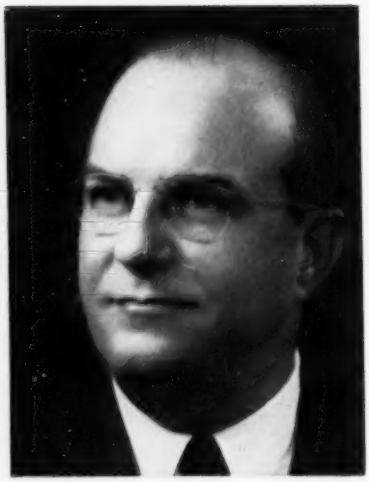
President Jack Baker of the California Fertilizer Association outlined the importance of the program of work of the Association's Soil Improvement Committee, which sponsors the Annual Fertilizer Conference.

Co-Chairmen J. H. Nelson and Earl R. Mog, both of Stockton, were in charge of the Conference program, with Nelson presiding. Formal papers were presented during the morning by Dr. Albert Ulrich, Plant Physiologist, University of Calif., Berkeley, on "Plant Analysis as a Guide to Fertilization"; "Soil Conditioners—Some of the Things Now Known About Their Effects on Soils and Plants," by Dr. R. E. Warnock, Agronomist, California Spray-Chemical Corporation, Richmond; Robert Z. Rollins, Chief, California Bureau of Chemistry, Sacramento, on topics involving regulation of the sale of fertilizers and agricultural minerals; "Potash Responses in Deciduous Orchards" presented by Dr. Kiyoto Uriu, Department of Pomology, University of California, Davis, from a paper prepared by Dr. Omund Lilleland, Pomologist, University of California; and "Potash Sources and Products," by M. E. McCollam, Western Manager, American Potash Institute, Inc., San Jose.

Following luncheon the delegates were divided into two groups. Two panel groups, one on Potash and the other on Micro-nutrients, rotated between these two rooms. Those on the Potash Panel were Dr. J. E. Knott, Chairman, Department of Vegetable Crops, University of California, Davis, Moderator; Drs. W. E. Martin, T. W. Embleton, O. A. Lorenz, and Herman Timm, all of the University of California, and Forrest Fullmer, American Potash Institute, Inc., Newport Beach.

On the Micro-nutrients Panel were Dr. D. G. Aldrich, Jr., Chairman, Department of Soils and Plant Nutrition, University of California, Davis and Berkeley, Moderator; and Drs. John Lingle, Kiyoto Uriu, Walter Reuther, and Arthur Wallace, all of the University of California.

Personals



JOSEPH A. HOWELL

Joseph A. Howell has been retained by **Commercial Solvents Corporation** as a consultant in the field of agricultural chemicals, it was announced by **J. Albert Woods,** President.

Mr. Howell will serve in an advisory capacity on a part time basis to the Company's management and to its agricultural chemicals marketing organization, Mr. Woods said.

Mr. Howell draws on 35 years of experience in the fertilizer and plant foods industry. He was the first president of NPFI when that organization was formed two years ago as a consolidation of NFA and APFC.

* * *

William R. Adams has been elected president of **St. Regis Paper Company,** succeeding **Roy K. Ferguson,** who continues as chairman. **Edward R. Gay** was elected vice-chairman. **Arch Carswell** and **Benton R. Cancell** were elected executive vice-presidents.

* * *

William R. Hancock has been named Florida "Man of the Year" by Progressive Farmer magazine. He is general manager of **Superior Fertilizer and Chemical,** Tampa, and has been for the past four years president of the **Florida Agricultural Council.**

* * *

John I. Taylor, former president of the **Oklahoma Farm Bureau,** has been made general manager of the **Nichols Seed & Fertilizer Co.,** Oklahoma City, merger of Nichols Seed & Fertilizer, and Nichols Seed.

* * *

Texas Gulf Surphur announces that **Walter H. Aldridge** has become chairman emeritus; **Fred M. Nelson** is chairman of the board; **Claude O. Stephens** is president. Vice-president **Holland R. Wemple,** has retired.

* * *

Chain Belt Company has announced three regional managers: **William Sivyer,** Midwest and South; **J. B. Roberts,** Eastern; **H. F. Bergis,** Northwestern. New district sales managers are: **J. S. Moore,** New York; **Harold M. Weil,** Philadelphia; **D. P. Murrill,** Atlanta; **W. E. Church,** Portland; **F. R. Traylor,** Charlotte and **C. D. Bergen** who will manage the new East Orange, N. J. office.

* * *

James A. Farley has been named field sales manager of **Commercial Solvents Corporation,** it was announced by **James V. O'Leary,** general sales manager of the company.

In his new post, Mr. Farley will be responsible for the administration of CSC district offices throughout the United States, and the direction of the field sales force, handling the Company's entire line of products including industrial and agricultural chemicals, automotive specialties, animal nutrition products and potable spirits.

Mr. Farley has been with Commercial Solvents since 1935, most recently as field sales manager for the industrial chemicals department. He will make his headquarters at the Company's executive offices at 260 Madison Avenue, New York City.

* * *

Raymond E. Burton, assistant sales manager for **Koehring Division,** Milwaukee, has been appointed to the new post of assistant director of marketing for **Koehring Company.** His new duties will cover both market research and analysis, according to **E. B. Hill,** director of marketing.

* * *

Stephen Collins, a graduate of Cornell University whose advanced degree from Rutgers University was awarded for work in botany, has been appointed to the forestry research staff of **The Connecticut Agricultural Experiment Station.** He will study successional trends in Connecticut woodlands to gain information useful in forest management.

* * *

Promotion of two researchers to the position of scientists and the awarding of the 1956 Gaston du Bois cita-

Commercial Solvents has named V. Keith Fuller, left, and Denzil M. Waller to its crop chemicals sales staff. Mr. Fuller is in the Illinois-Indiana territory; Mr. Waller is working out of the Louisiana office.

tions to two other members of **Monsanto Chemical Company's** inorganic chemicals division were announced by **E. G. Somogyi,** director of the director of the division's research department.

Erlington Saunders and **Dr. Edward J. Griffith** were promoted to the position of scientist in the division's research department. They are the first in the inorganic chemicals division to be named to this post.

Dr. John H. Payne, Jr. and **Dr. Joseph A. Brink, Jr.** were honored with the division's Gaston du Bois awards for outstanding research accomplishments during 1956. The late Gaston du Bois was a former Monsanto president and an outstanding scientist.

* * *

Charles A. Wood has been named sales manager, East Central area, for the Northeastern district of the plant food division of **Olin Mathieson Chemical Corporation,** it has been announced by **S. L. Nevins,** vice president. He will report to **A. B. Verdery,** manager of the Northeastern district, with headquarters at Baltimore, but will operate from 426 N. High Street, Columbus 15, Ohio.

Appointment of **Lawrence L. Cecil, Jr.,** as staff assistant in the export sales department of **Diamond Alkali Company,** Cleveland, Ohio, was announced by **S. S. Savage,** director of export sales.

At his new post, Mr. Cecil will devote his attention chiefly to promotion of agricultural chemicals sales, reporting to **S. B. Honour,** manager, export sales, agricultural chemicals.

* * *

W. R. Van Liere has been appointed vice president and general sales manager of the **Pacific Guano Company,** according to an announcement by **W. G. Hewitt,** president.

He will supervise sales of GRO Fertilizer, the Pacific Guano line of agricultural chemicals, agricultural seeds, and the line of Gaviota garden products.

Milton Rex Wingard who has been appointed vice president-technical director, and was simultaneously elected to the board of directors of Davidson-Kennedy Associates Company, designers and builders of chemical process plants and facilities. Prior to joining Davidson-Kennedy Associates in January, Wingard was project engineer, chemical plants division of Blaw-Knox Company.

The National Cotton Council has announced that **J. K. Jones** will work primarily with farm equipment companies and public research agencies in efforts to develop new or better machines for use in producing or harvesting cotton.

* * *

Clark Equipment Company has appointed **Steve Ragsdale** manager of development of its materials handling development center, according to **L. A. DePolis,** general sales manager of Clark's industrial truck division, sponsor of the Center.

* * *

Professor **Melvin Calvin** of the University of California, one of the world's leading authorities on photosynthesis, received the $1,000 **American Chemical Society Award** for Nuclear Applications in Chemistry at Miami, Fla., on Monday, April 8, during the Society's 131st national meeting.

F. H. Kennedy who has worked out of the Midwestern Sales Office of Potash Company of America for the past seven years has been assigned to take over the accounts formerly served by T. E. Bradley. Mr. Bradley, former Sales Manager of P.C.A's Midwestern Office has reached retirement age and is no longer on active duty with the firm. He remains with P.C.A. in a consulting capacity.

D. H. Denholm of the **Chase Bag Company** received the past president's plaque at a meeting of the St. Louis Chapter, American Institute of Industrial Engineers. Mr. Denholm, now manager of the Chase Bag manufacturing facility in New Orleans, was head of the firm's Industrial Engineering Department, located in St. Louis, while associated with the Chapter.

* * *

Arthur W. Gilbart has been elected assistant to the president to **Freeport Sulphur Company** by the board of directors, **Langbourne M. Williams,** president, has announced.

Mr. Gilbart, who formerly was with Freeport, has recently been vice president of the Equitable Life Assurance Society.

* * *

Eugene D. White has joined the sales division of **Werthan Bag Corporation,** and will cover the state of Mississippi and Northern Louisiana, making his headquarters in Jackson, Miss.

Union Bag-Camp Paper Corporation April 5 announced the appointment of William W. Dipman as director of market research and development. Mr. Dipman joined the Union organization in 1947.

N. C. Safety Section Meets May 10

During the 27th annual statewide industrial safety conference, staged by the North Carolina Industrial Commission, the Fertilizer Section will hold a meeting of its own on May 10 at 2:15 p.m. in room 35, Presbyterian Church, Winston Salem. Following is the program:

Chairman—Emil T. Chanlett, Associate Professor in Sanitary Engineering, University of North Carolina, Chapel Hill

Film—"Before Hydraulic Fires Start"

1. "Fire Safety"—O. F. Griffith, Jr., Safety Representative, N. C. Industrial Commission, Winston-Salem

2. "Attack the Back Problem"—P. W. "Joe" Logan, Division Manager, Loss Prevention Dept., Liberty Mutual Insurance Company, Atlanta, Georgia

3. "Getting the Safety Message to the Cash Payroll"—Marvin R. Jones, Superintendent, Kinston Plant, Smith-Douglass Company.

4. Film—"Proper and Safe Operation of Pay Loaders"—Presentation and commentary by William Bethune, District Safety Supervisor, N. C. Department of Labor.

The fertilizer safety men will also participate in other events of the big meeting, including the banquet that night, which will be addressed by Sam Bundy, who is rated as one of the best after dinner speakers in a state noted for such gifts. The Safety Queen Contest Finals will be held during the banquet, at the Robert E. Lee Hotel.

OBITUARIES

Dr. Fred Frazier Cowart, 47, director of the Georgia AES, died April 14 after a heart attack.

Carlton W. Crumb, with Dorr-Oliver for almost 30 years, died April 6 following a brief illness.

Roy L. Miller, 54, manager of the Rochester (Minn.) Fertilizer Co., died March 27 after a stroke.

Lloyd V. Rowley, 65, plant manager for the soil building division of the Grange League Federation, died March 14 at his home.

CF Staff-Tabulated TONNAGE REPORTS

FERTILIZER TONNAGE REPORT (in equivalent short tons) Compiled by Cooperating State Control Officials and Tabulated by COMMERCIAL FERTILIZER Staff

	March		February		Oct.-Dec. Qtr.		July-December		January-June		YEAR (July-June)	
STATE	1957	1956	1957	1956	1956	1955	1956	1955	1956	1955	1955-56	1954-55
Alabama	.....	246,239[1]	74,943	78,927	101,280	103,377	174,707	165,867	813,104	846,735	1,029,030	1,114,238
Arkansas	.....	92,766[1]	33,045	33,986	26,759	26,729	59,915	60,299	299,172	270,894	359,471	330,781
Georgia	140,374	133,176	47,427	47,499	168,751	170,229	253,559	250,968	993,954	1,047,875	1,244,422	1,273,445
Kentucky	.....	77,228[1]	43,070	35,730	50,075	58,090	90,284	91,478	441,481	431,024	529,600	522,410
Louisiana	45,682	57,828	26,266	22,925	46,979	36,496	71,129	59,345	214,343	232,781	273,688	310,848
Missouri	141,783	145,449	50,189	55,852	154,331	192,239	331,343	356,241	450,102	414,503	804,441	682,690
N. Carolina	.....	417,258[1]	145,662	178,075	148,970	163,008	216,234	225,182	1,424,267	1,566,158	1,649,449	1,830,633
Oklahoma	15,308	18,749	8,877	11,191	29,343	29,195	54,509	69,542	65,854	63,799	135,396	122,204
S. Carolina	233,862	286,994	120,593	123,996	79,910	78,592	122,929	119,947	743,670	796,111	863,617	928,715
Tennessee	29,825	33,783	12,332	13,554	107,591	95,140	165,796	154,230	378,676	355,966	515,551	523,349
Texas	100,795	101,164	70,497	52,179	130,969	117,563	202,406	193,704	377,805	375,176	566,399	588,062
California		(reports compiled quarterly)			231,361	188,204	412,747	361,615	639,377	603,657	1,001,554	922,127
Virginia		(reports compiled quarterly)			78,509	91,645	154,075	162,709	599,111	636,585	761,820	795,770
Indiana			(reports compiled semi-annually)				305,939	255,131	807,918	873,966	1,063,049	1,158,960
Iowa			(reports compiled semi-annually)				85,147	130,000	315,329[1]	.....	445,329[1]	.....
Michigan			(reports compiled semi-annually)				.....	.....	443,908[1]	.....	.....	.....
New Hampshire			(reports compiled semi-annually)				3,253[1]	.....	13,168[1]	.....	.....	.....
Washington			(reports compiled semi-annually)				55,709	48,749	103,885	124,186	152,674	182,348
TOTAL	707,626	777,143	632,901	653,914	1,354,828	1,350,507	2,756,428	2,705,037	8,352,719	8,639,506	10,950,161	11,286,580

(not yet reported) * Not compiled [1] Omitted from column total to allow comparison with some period of current year.

MARKETS

ORGANICS: Prices of fertilizer organics continue practically unchanged and demand steady. Leather Nitrogenous Tankage is currently priced at $3.25 to $4.00 per unit of Ammonia, f.o.b. production points.

Activated Sludge prices continue at previous levels of $2.95 per unit of Ammonia and 50c per unit of APA, bulk, f.o.b. Midwest production point, with another production in the Southwest priced at $3.00 per unit of Nitrogen and 50c per unit of APA, bulk.

CASTOR POMACE: There is now only one producer of domestic Castor Pomace in the Eastern market and production is on a very limited scale. Practically all of this product is committed for the next 30 days and the price is nominally $45.50 per ton, in bags, f.o.b. Eastern seaboard production point.

DRIED BLOOD: Unground bagged cattle blood is currently around $6.00 to $6.25 per unit of Ammonia f.o.b. Chicago area and the New York market is somewhat lower at $5.25 per unit of Ammonia.

POTASH: This market continues steady with no changes in prices and movement is in good volume.

GROUND COTTON BUR ASH: Movement of this source of Potash, primarily in the form of carbonate of Potash, continues steady. Current analyses are running about 38% to 40% K_2O and delivered cost compares with Sulphate of Potash for most areas.

SUPERPHOSPHATE: Production figures for both concentrated and normal Superphosphate continue somewhat behind the same period for last season but prices remain steady and slightly higher than last season.

PHOSPHATE ROCK: Movement has been hampered somewhat by the inclement weather in various parts of the country recently but volume is due to pick up strongly in the next few weeks.

NITRATE OF SODA: There is currently a lull in movement of Nitrate of Soda but shipments should advance in volume during the May and June period. Prices continue unchanged at $48.00 per ton, in bags and $44.50 in bulk f.o.b. port warehouses.

CALCIUM AMMONIUM NITRATE: Prices remain unchanged for the usual brands of this 20.5% Nitrogen which is priced at $44.00 per ton bulk and $48.00 per ton f.o.b. Mid-Atlantic Seaboard production point, and f.o.b. Atlantic and Gulf ports.

GENERAL: Adverse weather conditions in the Southeast have hampered the movement of mixed fertilizers but movement of direct application Nitrogen, in some areas, is slightly greater during the last six months than for the same period last season. The Soil Bank program continues to affect the general use of fertilizer and it is expected that total figures for the season will be less than for last season.

Bagging Machine Suit Still In Courts

In the April issue Commercial Fertilizer carried an item released by the Kraft Bag Corporation relating to a patent infringement suit filed by Inglett and Company, Inc. of Augusta, Georgia, against the Everglades Fertilizer Company of Florida for infringement of the Wilfred L. Inglett patent covering the I & C bagger. Our caption stated that the suit had been resolved.

We have since been advised by Richard Spencer of Stamford, Connecticut, attorney for Inglett and Company, that the litigation is still pending. Mr. Spencer states: "In the Florida case the decision of Judge Lieb has been appealed to the U. S. Court of Appeals for the Fifth Circuit. Additionally, a separate suit was brought by Inglett and Company in the United States District Court for the Eastern District of Virginia, Norfolk Division, against Baugh and Sons, another user of the Kraftpacker Open Mouth Bag Filling Machine sold by Kraft Bag Corporation. In the Virginia case Federal Judge Walter E. Hoffman denied a motion for summary judgment and ordered the case to a trial on the merits which was held on January 21-23. Briefs are being filed; no decision has yet been announced in the Virginia case."

'56 Agricultural Potash Deliveries Near Record Peak Of 1955

Deliveries of potash in North America by the seven leading American potash producers and the importers during 1956 amounted to 3,932,527 tons of salts containing an equivalent of 2,307,961 tons K_2O, according to the American Potash Institute. This was an increase of 103,370 tons K_2O or less than 5% over 1955.

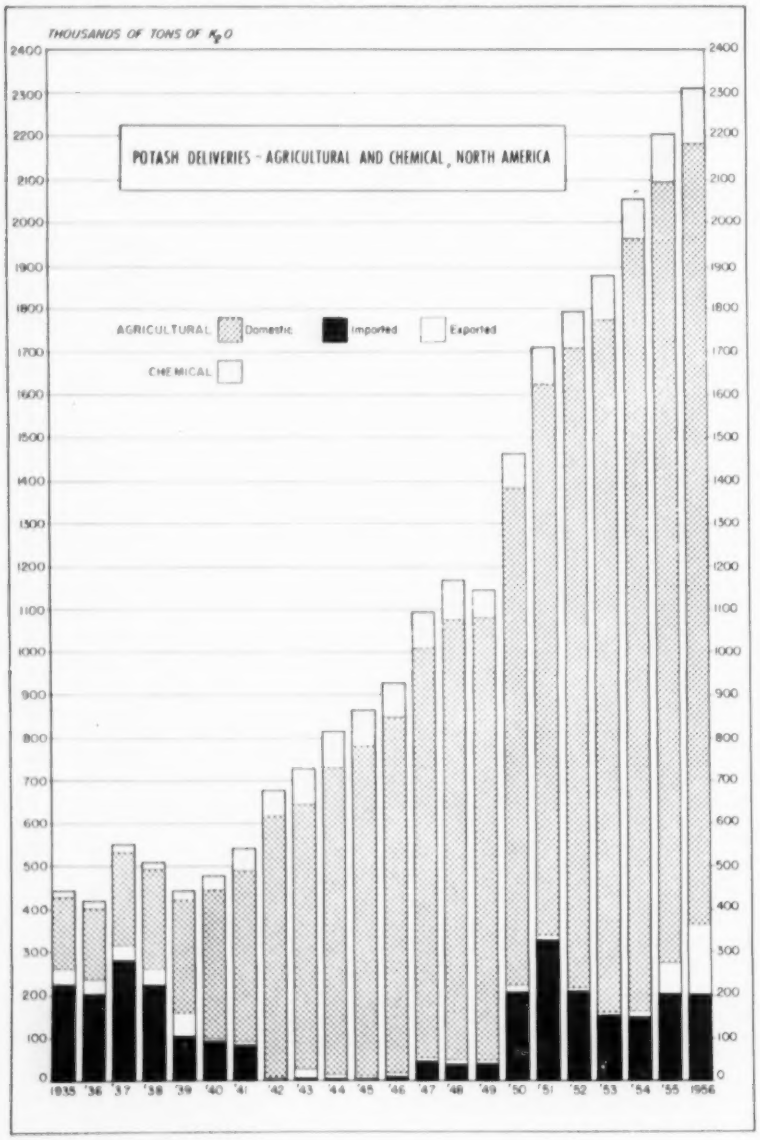
Deliveries for agricultural purposes in the continental United States for 1956 were 1,872,704 tons K_2O, a decrease of 5,885 tons under 1955. Canada received 89,280 tons K_2O, Cuba 14,647 tons, Puerto Rico 20,192 tons, and Hawaii 23,358 tons. Exports to other countries amounted to 162,871 tons K_2O.

In this country, agricultural potash was delivered in 47 states and the District of Columbia. Illinois with nearly 200,000 tons K_2O was the leading state followed in order by Ohio, Indiana, Georgia, Florida, and Virginia, each taking more than 100,000 tons K_2O during the year. Due to shipments across state lines, consumption does not necessarily correspond to deliveries within a state.

Agricultural potash accounted for nearly 95% of deliveries. Muriate of potash continued to be by far the most popular material, comprising over 92% of the total K_2O delivered for agricultural purposes, and sulphate of potash and sulphate of potash magnesia nearly 8%.

In the fourth quarter of 1956, deliveries totaled 1,150,934 tons of salts containing an equivalent of 665,324 tons K_2O, an increase of nearly 11% compared to K_2O deliveries during the same period in 1955. The continental United States received for agricultural purposes 524,274 tons K_2O, Canada 44,023 tons, Cuba 4,115 tons, Puerto Rico 4,812 tons, and Hawaii 3,926 tons. Exports to other countries were 55,320 tons K_2O.

In addition to the regularly reported deliveries on the quarterly basis, information from governmental and other sources indicates that during the second half of 1956 there were additional imports of European potash into the United States, Canada, Cuba, and Puerto Rico of 98,753 tons K_2O as muriate of potash and 23,950 tons K_2O as sulphate of potash. These figures are included in the deliveries for the fourth quarter.



SAFETY . . . AP&C Plant Breaks Own Safety Record

The Trona plant of American Potash & Chemical recently set an all-time record of 2,000,000 man-hours without a lost-time accident.

The safety record, involving more than 850 employees at the company's main plant at Trona, Calif., covered nearly a full year without a lost-time accident.

The plant's previous record of 1,000,000 safe man-hours was set between August and December of 1954, after which AP&CC received the Lammot du Pont Safety Award for the greatest improvement in safety in the chemical industry.

Since then, AP&CC has received more than 10 safety awards as a result of the company's intense safety education program conducted for the past three years.

Arkell & Smiths Offer New Welded-Seam Multiwall

Arkell and Smiths have announced production of their new "welded seam" multiwall bag.

The "welded seam" is an extrusion of molten polyethylene upon Kraft paper, in multiwall bags with polyethylene coated liners, which results in an extremely tight adhesion between the two in the seam of the bag. The manufacturer claims the seam of the bag is as impervious to chemicals as polyethylene itself.

There is no upcharge for this feature which A&S believes is exclusive with them. The bag is available in sewn open mouth constructions, shipped from A&S's Mobile plant. For more details, write Arkell & Smiths, Canajoharie, N. Y.

FERTILIZING to prevent PLANT DISEASE

by Dr. Harlan E. Smith
Extension Plant Pathologist
Texas A&M College System

Soil fertility may affect the amount of plant disease, but it is only one thing among many. It is difficult to make a general statement about the effects of fertilizers on disease for several reasons. Some of these reasons are that crop plants require different amounts of fertilizer, soil types vary, and many different diseases attack crop plants. Many diseases are most destructive when plants are growing rapidly. Some other diseases are severe on weakened, under-nourished plants. Most contagious plant diseases can be roughly divided into two groups: **(1)** Those which may affect crops well supplied with fertilizers such as rusts, powdery mildews and many bacterial and virus diseases. **(2)** Diseases which may affect plants weakened by lack of fertilizers such as numerous root rots, cankers, wilts, and leaf spots.

There is a need for us to understand the effects of soil fertility on plant diseases when fertilizer practices are being changed so rapidly. More and more commercial fertilizer and agricultural lime are being used. Less barnyard manure is being added to the soil each year. Many Texas soils are lacking in organic matter. Residues from organic matter are valuable for stimulating the growth of beneficial micro-organisms in the soil. These micro-organisms may prevent or destroy the growth of some plant disease parasites.

The most important thing in fertilizing soil is to use such materials in combination with suitable crop rotations and other soil management practices, as are necessary to promote the maximum economic productivity of the plant. In the use of fertilizers in disease control, one must avoid certain conditions such as an excess of nitrogen or other available nutrients, a deficiency of potassium, or changes in soil reaction that may affect diseases of a crop. No amount of fertilizer application is an adequate substitute for crop rotation, disease resistant varieties and other commonly used disease control measures. In applying fertilizers to all crops, use results of soil tests tempered with your own experience. If plant diseases are present, make sure of their identity. Inform the soil testing laboratory of the presence of the plant disease when sending in soil samples.

When diseases become serious on adequately fertilized crops, other control measures such as spraying, crop rotation, use of disease resistant varieties, etc., will have to be used. It is poor farming practice to grow a crop in poorly fertilized soil in order to escape disease. If a plant has plenty of available fertilizer nutrients, expensive disease control measures such as spraying and soil disinfestation may be fully justified. Often expensive disease control measures are not worth applying to weak and poorly fertilized plants.

Apple

Apple and pear trees which have too much succulent growth due to excessive nitrogen fertilization are very susceptible to severe fireblight injury. Fertilization and other cultural methods to promote vigor in apple trees are sometimes needed in older, run-down orchards, although this increases susceptibility to fireblight.

Charcoal Rot

This disease can be lessened to some extent by maintaining the fertility of the soil and adding organic matter; however, irrigation during dry weather is probably the most important factor in control.

Chlorosis

There are several causes of the yellowing of the leaves of plants known as chlorosis. Certain plants growing in highly calcareous or alkaline soils, such as occur in the black lands or the lower Rio Grande Valley, often show this yellowing of the foliage, usually caused by deficiency of iron. Although usually present in abundance, the iron in alkaline soils is not available to most plants. In order to provide an acid condition of the soil, iron sulphate, sulphur, aluminum sulphate and various types of organic matter have been used. More recently iron-chelates have been used successfully in preventing iron deficiency.

Cotton

Fusarium wilt on cotton can be controlled by heavy applications of potash on potash-deficient soils, and the use of resistant varieties if nematodes are not present. On moderately fertile soils an excess of nitrogen may cause fusarium wilt to be more severe. A surplus of phosphate may also cause fusarium wilt to be more severe, but usually phosphate is not influential as the balance between potash and nitrogen. Much of the fusarium wilt promoted by excess nitrogen can be avoided by plowing under green manure crops. Fusarium wilt is generally more severe in acid type soils. There may be danger in using one particular green manure crop year after year. Susceptible crops such as hairy vetch may increase the populations of root know nematodes to the extent of causing increased losses in the cotton crops that follow them. On the other hand, increased organic matter is beneficial in improving yields and reducing fusarium wilt losses.

When heavy applications cause nitrogen to be out of balance, verticillum wilt may be more severe.

In applying fertilizer, each local situation has to be examined individually, but the principle of nitrogen lessening cotton root rot and phosphorus increasing it should be followed as much as possible (except in the Temple area of Texas).

Peaches

Trees supplied with adequate nitrogen are better able to withstand damage resulting from bacterial spot. (Bacterial spot can cause severe damage to peach trees in Texas.) Premature loss of leaves as a result of severe disease attacks makes the trees more susceptible to other natural hazards. Loss of leaves also prevents manufacturing of true plant foods such as carbohydrates, fats, and protein. These true plant foods are not taken from the soil; however, plant food nutrients and water of the soil are combined with the carbon-dioxide of the air and in the presence of sunlight are changed within the leaf to carbohydrates, fats, and proteins. The carbohydrates, fats and protein manufactured in the leaves are used to build fruit and seed as well as store up plant food reserves for the winter. This is one of the reasons it is important to have plenty of healthy disease-free leaves on the tree during the entire growing seasons of the year. Maintaining the proper level of fertility is just one of the ways of preventing the disease from

Presented at Texas Fertilizer Conference, College Station, January 9.

eventually killing the trees.

Pear (See Apple)

Pecans

Rosette (zinc deficiency) can be prevented by adding zinc sulphate. Spray two times with zinc sulphate solution (one pound to fifty gallons of water) beginning about one month after the buds open and repeating in three to four weeks (if trees are sprayed for insects or disease, zinc sulphate may be added to the mixture). Add zinc sulphate (one pound for each inch in diameter of trunk) to soil over the region of the roots, in February. Work the zinc sulphate in the top soil. This soil treatment is most effective on acid soils.

Potatoes (Irish)

Various soil factors influence the severity of common scab disease. One of these which has received much study is soil reaction. Numerous experiments have shown the extent of infection is reduced quite rapidly as the pH decreases below about 5.2. There is some evidence that above about pH 8.0 infection is also inhibited. Within the range of pH 5.2 and 8.0 the severity of the disease is little influenced, although it tends to increase somewhat up to pH 7.0. There are numerous records of some infection at pH 5.0 or less. This has been explained to the presence of strains highly tolerant to the acid soils. However, it is rather generally excepted that when potato soils are kept at pH 5.0 to 5.2, the disease is usually under commercially satisfactory control.

Rice

The severity of stem rot can be reduced by applying a properly balanced fertilizer. Heavy nitrogen tends to make stem rot worse; whereas, potash will tend to prevent severe losses. Complete fertilizers should be applied to fields infested with the stem rot fungus.

Small Grain

Heavy applications of nitrogen promote rapid growth of wheat, oats, and barley and may increase the severity of powdery mildew on wheat and barley. Potash in the form of potassium silicate has improved mildew resistance of wheat and barley to a certain degree. Some control of seedling-infecting smuts and seedling blights caused by the Helminthosporiums can be obtained by applications of fertilizer so as to induce early rapid growth of small plants.

Heavy supplies of nitrogen will increase the susceptibility of foliage to cereal rusts. Where there is an adequate supply of potash in the soil, it increases the resistance of wheat, rye, and oats to leaf rusts. Although phosphorus has little effect on the severity of leaf rusts, it may increase resistance slightly when other nutrients are available in adequate amounts. Heavier infection of disease usually is promoted by increasing amounts of balanced nutrients available to the cereal plant. However, increased balanced nutrients are also necessary for increased yields. This makes it important that disease-resistant varieties be used, if available.

Strawberries

Fruit rots are difficult to control when rainy weather prevails during harvest. Avoid excessive foliage produced by applications of nitrogen too close to harvest. This heavy foliage prevents the fruit from drying out during moist periods. Wet berries can be more easily attacked by fruit-rotting fungi.

Sweet Potatoes

Pox or soil rot may be prevented to some extent by the broadcast application of from 500 to 1000 pounds of sulphur per acre and worked into the soil one month before setting plants. (maintain soil acidity around 5.0 pH)

Tomatoes

The most important control meas-

SAFETY . . .
Picture of the month

Shown studying the bulletin board, which constantly preaches safety to the personnel of the Coronet Phosphate Co. operation at Lakeland, Fla., are two men—each of whom has won 13 prizes for submitting safety suggestions. They are W. A. Kirkland and D. S. Bianchi.

ure for blossom-end rot of tomato is to insure a uniform abundant supply of soil moisture but in addition a balanced fertilizer should be used. Where side dressings with highly available nitrogen fertilizers are to be applied they should be preceded by an ample supply of phosphorus and calcium.

Seedling Disease Control

Young plants of many crops are attacked by fungi that live in the soil or are carried on the seed. Several fungi naturally living in the soil are stimulated to growth by organic matter around the germinating seed. If seed germination or small plant development is delayed by excessive moisture or low temperatures, the fungi may invade the seed or girdle the young plant before the plant can establish itself. These fungi do less damage as ideal growing weather occurs. With good weather the plant begins to manufacture its own food and the underground parts become hardened so that the plant is better able to ward off fungus disease attacks. In general, damage from damping-off and root rot on young plants is avoided to some extent by promoting rapid development of roots. The critically important nutrients for such growth are nitrogen and phosphorus; consequently, properly balanced nitrate and phosphate fertilizers are beneficial, applied at or near planting time on deficient soils.

General Statements on Fertilizers

In general, the balance of nutrients may be more important that concentrations of total fertilizer nutrients when plants are exposed to attacks by disease parasites.

A deficiency or surplus of any one fertilizer element may often promote disease.

No general rules can be laid down about fertilizing soils so as to avoid disease. Each disease must be considered by itself. More information is needed regarding the effect of fertilizers on many plant diseases.

Any sound fertilizer recommendation must be based on a great many factors, including the character of plant disease agents that are most likely to strike plants in the area.

NPFI Announces June Program —Attendance Will Exceed 1000

More than a thousand representatives of the fertilizer industry and agricultural leaders are expected to attend the annual meeting of National Plant Food Institute at The Greenbrier, White Sulphur Springs, W. Va., June 9-12.

Senator Karl E. Mundt of South Dakota, member of the Senate Committee on Agriculture and Forestry, will be the principal speaker at the general session on Tuesday, June 11.

The convention will begin with registration on Sunday, June 9, and a meeting of the Institute's Board of Directors is scheduled during the afternoon or evening.

C. T. Prindeville, Chicago, president of the Institute, will preside at the two general sessions to be held on Monday, June 10 and Tuesday, June 11.

The program for Monday, June 10, follows:

A panel discussion on "How Big is the Fertilizer Market?" with O. E. Anderson, secretary, Ohio Bankers Association, as moderator. Panel speakers will be E. T. York, Northeast manager, American Potash Institute, who will discuss the subject "From the Soil and Crop Standpoint"; Wilbur Renk, outstanding Wisconsin farmer, speaking "From the Farmer's Standpoint"; Gordon B. Nance, professor, Department of Agricultural Economics, University of Missouri, speaking "From the Economic Standpoint"; and Mr. Anderson, speaking "From the Bankers' Standpoint."

Russell Coleman, executive vice president of National Plant Food Institute, will follow the panel presentation, with a discussion on "How Your Institute Can Help Expand the Fertilizer Market." The annual business session of the Institute will follow.

The Institute's Research and Education Committee will meet in the afternoon. The committee consists of the following three divisions: Agronomy and Horticulture, Fertilizer Technology, and Economics and Farm Management. Dr. W. H. Garman, the Institute's chief agronomist, serves as secretary. Reports will be made by the chairmen of the respective divisions.

The Hospitality Hour will be an afternoon feature with the nitrogen producers as hosts and a special program has been prepared for the ladies attending the convention.

The program for Tuesday, June 11, follows:

Raymond Rodgers, professor of banking, Graduate School of Business Administration, New York University, will discuss "The Current Economic Outlook for Business." He will be followed by Senator Mundt.

Winners in the Institute's "Soil Builders Award for Editors" contest will be presented scrolls by Mr. Prindeville. Two editors will be honored, one in the field of magazines with more than 300,000 circulation and the other in the field of magazines with less than 300,000 circulation.

The potash producers will be host at a hospitality hour, followed by the annual banquet of the Institute.

Recreation will include a men's golf tournament, a tennis tournament, horseshoe pitching contest, and a ladies' bridge and canasta party.

GOOD MANAGEMENT = GOOD PASTURE

Permanent pastures are largely restricted to low-growing species, such as bluegrass and white clover. These pastures are declining in importance, yet still have a place in modern farming. They use nontillable land. The bluegrass-white clover combination is welcome for spring and fall grazing. Timely fertilizing and liming help keep permanent pastures thrifty.

Legumes require protection

Legumes usually are the key to economical plant mixtures but are most difficult to maintain. Vigorous grasses tend to shade out and starve the legumes. Sprague suggests that pasturing practices should, therefore, be aimed at retaining the legume.

Forage plant types vary biologically and the harvest almost always favors one species at the expense of the others. For greatest advantage, the conflicting needs must be balanced—the grass curbed at times or otherwise handled to protect the legume. Seeding grass thin helps some, but proper cutting and fertilization help more. Where legumes have disappeared, nitrogen is needed to boost yield and protein level in pasture grass.

For a closer look at pasture management, consider some grazing possibilities on a typical Central Pennsylvania farm specializing in livestock and cash crops. There's usually small grain to graze in late fall and again in late winter. Permanent pasture will be ready for grazing early in the fall and again in the following spring.

On this farm, pasturing through the summer months might largely depend, for example, on orchardgrass-Ladino clover, orchardgrass-alfalfa, or bromegrass-alfalfa mixtures. Sometimes a planting of an annual such as sudan grass is needed for the possible hot, dry periods of late summer.

These combinations would be most important for both grazing and storage as silage or hay. The handling of these mixtures, especially in the grazing phases, may be the key to success of the program as a whole.

Timing of harvest critical

Taking a first harvest of orchardgrass-Ladino meadow when the grass was coming into head — the customary practice—was too late in the State College study. Although vegetation is heaviest at that time, grass may already have weakened the clover. Starting the first grazing when the grass was 8 or 10 inches high gave nutritious forage and favored the clover. Similarly, cutting alfalfa-grass mixture when alfalfa is in bud, rather than in bloom, gives a better quality hay or silage. Earlier cutting also may give an extra grazing.

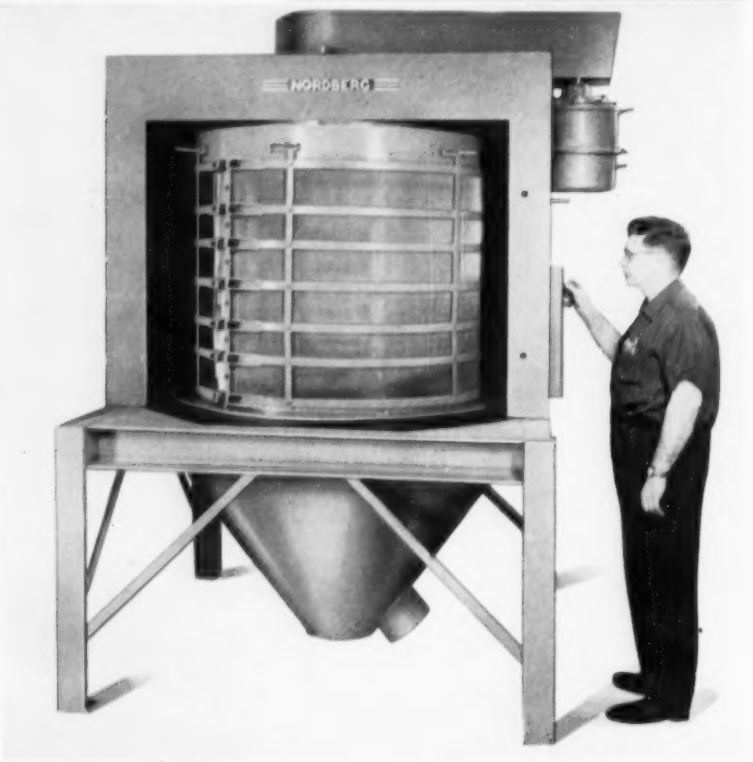
There's a question of how important irrigation might become in eastern forage production, particularly since droughts tend to be brief in most of the region. At State College, ARS soil scientist R. R. Robinson found one thing clear: in general, forage plants can stand much drought—even some wilting—before artificial watering becomes a critical need.

Dry plants come back fast

Even after fairly long period without growth, watering caused such quick recovery in shallow-, medium-, and deep-rooted species alike. Pure stands of alfalfa and orchardgrass, allowed to wilt and then

(*Concluded on page 68*)

Symons V-Screen with one cover removed to show the screening material as it is mounted on the revolving drum. The supporting base contains hoppers for the collection and discharge of the screen products.



Nordberg Announces Vertical Screen For Fines

Nordberg Manufacturing Company announces the development of the Symons V-Screen, a high capacity vertical screening unit for the sharp separation of either wet or dry materials. This screen is specifically designed for single separations in the finer sizes, ranging from 4 mesh down to as small as 80 mesh.

The V-Screen is the only vibrating screen that does not depend on gravity alone to size. Its entirely new screening action utilizes the additional force of centrifugal action created by its rotating vertical drum. The screening principle employs controlled diffused feed and vertical flow of material with a relatively low rotary speed and high speed gravatory action. The combination of the high speed gyration and drum rotation produces a separating force equal to about five times gravity, to pull the undersize through the apertures.

The compact design of this vertical screen results in a minimum floor space requirement and ease of installation. The base for supporting the Symons V-Screen contains hoppers for collection and discharge of the screen products. The screening drum is fully enclosed in a dust proof and watertight housing with easily removable covers. Any standard screening surface, including woven wire cloth, perforated plate, or rigid type screening surface can be mounted on the V-Screen drum. No special hooks or attachments are required.

The Symons V-Screen has been field tested on chemicals, fertilizers and minerals. It has proven its ability to screen or dewater these materials with high efficiency, even in the finer sizes.

GOOD PASTURE

(Continued from page 67)

clipped and watered, produced as much forage at the next cutting as plants under frequent irrigation. Some eastern forages—especially timothy, bromegrass, and tall oatgrass—haven't responded well to irrigation except in extreme drought. Continued moist growing conditions may foster diseases and cut fall growth of these plants.

County agricultural agents and State extension or experiment station specialists are familiar with special management needs of their areas.

(From: U.S.D.A.'s "Agricultural Research")

CLASSIFIED ADVERTISING

For Sale, Exchange and Wanted Advertisements, same type now used, EIGHT CENTS a word for one insertion; TWELVE CENTS a word for two insertions; FIFTEEN CENTS a word for three insertions, and FOUR CENTS a word for each insertion more than three; ADVERTISEMENTS FOR THIS COLUMN MUST BE PAID IN ADVANCE.

PLANT SUPERINTENDENT wishes to make a change, 19 years experience in 50 thousand ton capacity plant. Married, 3 children, age 39. Write Box #59, c/o Commercial Fertilizer, 75-3rd St., N.W., Atlanta, Ga., for reference and business resume.

POSITION WANTED: Sales Manager, experienced, hiring, training, supervising, salesmen, fertilizer & ingredients. (Wholesale) Box K, Commercial Fertilizer, 75-3rd St., N.W., Atlanta, Ga.

FOR SALE: One Corken Anhydrous Ammonia Compressor No. 91-L-107, complete with hose and fittings to unload Ammonia from Railroad tank cars to storage or nurse tanks. This outfit is almost brand new. Will sell reasonable. Farmers Cotton Oil Co., Wilson, N. C.

FOR SALE: Rotary Dryers 5' x 30', 5' x 40', 4'6" x 50', 5' x 67', 6' x 60', 9' x 80'. (1) Pressure Tank 13,000 gal. 220#. Also Mixers, Storage Tanks, Screens, Elevators. Send us your inquiries. Brill Equipment Company, 2402 Third Ave., New York 51, N. Y.

FOR SALE: J. B. Model W. Hammer Mill; Ribbon Mixers 336 and 56 cu. ft.; Gemco 6' dia. Conical Blender; Rotary Dryers 3 x 24", 4'6 x 30', 5' x 30', Steel & Aluminum Tanks 400 to 23,000 gal. Also, Pulverizers, Conveyors, etc. Perry Equipment Corp., 1426 N. 6th St., Philadelphia 22, Pa.

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